cycles

—A MONTHLY REPORT

June—July 1953

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

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cycles
—a monthly report

The official Bulletin of the Foundation for the Study of Cycles

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The Director's Letter

Dear Member:

Cycles-The Science of Prediction Being Brought Up to Date

In accordance with the promise in my letter for May, we are starting, in this issue, the serial publication of a revised and up-to-date edition of *Cycles—The Science of Prediction*. This is a book about trends and cycles written in 1944 by Mr. E. F. Dakin and myself.

Text Book of Cycle Analysis

Also, in accordance with my promise, I have started to write a text book of cycle analysis. Unless the publisher objects to its pre-publication appearance in serial form, it will be printed in the quarterly *Journal of Cycle Research*, chapter by chapter, as written.

The Journal of Cycle Research

The spring issue of the *Journal of Cycle Research* contains a 25 page article by Dr. Leonard W. Wing showing step by step the methods he used to make an analysis of cycles in the abundance of lynx. If you are interested in making cycle analyses of your own, you will probably wish to read it. The methods can be applied to any series of figures.

The New Policy for Cycles—A Monthly Report

This is the first issue of *Cycles-A Monthly Report* prepared exclusively for those who want to know as much as possible about the cycle work of others and its practical implications for the future—and who want to keep as far away as possible from technical details. If your interest is non-technical, as it probably is, I hope you find it an improvement.

As I wrote you last month, henceforth technical details will be segregated in the *Journal of Cycle Research* for the benefit of the folks who like to do this sort of thing for themselves.

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Cycles in War

Readers of these reports are not surprised at the recent easing of international tensions. Nor will they be lulled by any such easing into any false feeling of permanent security.

International conflict waxes and wanes in cycles, as I have reported to you upon a number of occasions.

The most important cycle in international conflict averages about 22 1/7 years from crest to crest. Crests represent time of maximum conflict; troughs of course represent times when conflict is at its lowest ebb.

In my report for February 1951 I told you that the 22 1/7 year cycle was ideally due for its trough 3/10 of a year past the middle of 1952.

In my report for April 1952 I told you of a second cycle of international conflict which is 11.2-years long from top to top, which is on its way down, and which is ideally due for its trough in 1956.

Finally, in my report for June of 1951 I told you of a third cycle of international conflict about 3.4-years long due for a minor crest the latter part of 1951. Its trough is of course due half a cycle later right now at mid 1953.

Thus at the moment, if the cycles of the past are continuing, the important 11-year cycle of international conflict is on its way down and will continue downward for three more years. However, do not forget that the important 22 1/7 year cycle has already turned up, and that the minor 3.4-year cycle is due to turn up this month.

As soon as I can find the time I will put together for you a composite of the 22.14-year, 11.2-year, and 3.4-year cycles of international war so that you can see the extent to which the war index has (and has not) conformed to the combination of these three regular cycles, and exactly what these three cycles suggest for the future.

In the meantime, with the 11-year cycle due to be going down until 1956, after which all three cycles are due to be going up together, it might be a good guess to hope for perhaps three more years of relative peace. However, in the past there have been many many exceptions to the cyclic patterns, and one can do no more than speak in the most general terms of *probabilities*.

As I see it, the advantage of information regarding cycles in war is not so much to date the outbreak of World War III, as to preparing you for a period of relative international peace at this time, *and to warn you that such a period of relative international peace is only temporary*.

I keep stressing *international* conflict because *civil* conflict seems to wax and wane in almost the opposite way. When we human beings are not engaged in international war we seem to turn to internal strife.

It is not only the old Irishman into whose mouth James Stephens could put the words, "I say this, that if every person had enough to eat there'd be no more trouble in the world and we could fight our fill."

● ● ●

The 6 1/2 Week Cycle

The article in this issue about the 6.55-week cycle in a common stock interests me greatly. It shows what can be done by an amateur who is willing to spend the necessary time and effort. It provides us with an important piece of the mosaic we are trying to put together.

The 6+-Week Cycle in Other Phenomena

I first ran into a 6+-week cycle in 1937 in connection with a cycles study of in prices of cotton print cloth. Later, I was told that a cycle of this length was fairly well known in the cotton goods industry. I was given the name of one firm which confined its purchases of cotton print cloth to alternate three week periods, so as to gain the advantage of this cyclic behavior.

I next ran into a 6+-week cycle in 1938 in connection with a study of cycles in raw sugar prices. A rather crude determination of its length suggested 6.8 weeks. Whether the cycle in the prices of cotton print cloth and the cycle in the prices of raw sugar are one and the same, and whether either or both are the same as the cycle discovered by Mr. Grand has not yet been determined.

● ● ●

The Actuarial Method

Another reason I like Mr. Grand's 6 1/2 week cycle in that it is the sort of thing that can be played on a actuarial basis.

However dramatic and encouraging some cycle forecasts of the market as a whole may have been, I continue to feel that we do not yet know enough about cycles so that such forecasts can be relied upon as uniformly dependable.

How to Make Money from Cycles

I have told you time and again that I think the best way to use a knowledge of cycles to make money in the market is to learn about the significant short cycles and, if you want to speculate, to play these short cycles on a round trip basis (*long* on the up side, *short* on the down side). If you do this, the general trend of the market will usually make no difference. A bull market will decrease your short profit but will increase your long profit by an equal amount. A bear market will do the reverse. In either case you will come out at almost exactly the same place as if the market were going sideways.

Such a program is one that you have to work out for yourself. If I tell you (and all our other members) that Squnkum Preferred has 37 9/16-day, 16 1/5-day, and 43 9/10-day cycles, indicating buying points at June 17th, July 32nd, and September 33rd, and if any fair number of members buy and sell on the indicated days, the cycles in Squnkum will presently be obliterated, and instead of making money, all of you will loose it.

If you want to use a knowledge of cycles to make money you must do what Mr. Grand did—find your own cycles in your own stocks (or your own commodities), and like Mr. Grand keep at least the name of the stock to yourself.

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How We Used the Predix Forecast

When, in the middle of June, you read this letter you will know more than I know now of the outcome of Mr. Hughey's *Predix* forecast that an important decline in stock market prices might begin about March-April of 1953.

I called your attention to this forecast in my reports for January, February, and April 1952 and reprinted it in full in our reports for March, April, and May 1953.

As I write this letter (April 11th) the forecast which Mr. Hughey published last year (June of 1952) seems to be working out nicely. Stocks are drifting downward in accordance with expectations, but of course I have no way of knowing if the forecast will continue to work.

Last January I did not know that even this much of it would work out, but in connection with Foundation affairs I reasoned this way: "As it is a well known fact that people respond better to financial advertising when the masket is going up, let us assume that Hughey may be right, and let us concentrate our promotion efforts in January, February, and March of 1953, easing up in our promotion efforts in April, May, June, July, and August. Let us however be ready to shoot the works again in September, October, and November, of 1953 so that, if the market should happen to go up at that time in accordance with the 1952 Predix projection, we would be ready to take advantage of the advance without the delay of a moment."

With these thoughts in mind we sent out a flood of letters in January, February, and March—with the result that so far this year we have acquired a total of 845 new members. This is the greatest increase of membership in a comparable time in the history of the Foundation.

We are now placing printing orders so that we will be ready to take advantage of Mr. Hughey's September-November rally, if it should occur. Of course, heeding the advice of Will Rogers, printed for you in our last report, if the market does not go up at that time we will not buy.

When I speak of a September—November 1953 rally I refer of course to a rally forecast by Mr. Hughey a year ago. Perhaps, as a result of the year of work he has put in on the problem since that time, Mr. Hughey now has different ideas. I do not know because I have not seen his revised forecast for 1953—54 which I understand is still at the printers. If the new cycles he has isolated modify his previous forecast we will modify our promotion plans accordingly.

● ● ●

Respectability

In some quarters a belief in the significance of cycles is not quite respectable. It is regarded like a belief in astrology or alchemy or tea leaf reading.

I remember a conversation with the executive vice president of one of our largest corporations. "I believe you really have something," he said, "but I wouldn't want my people to know I took stock in anything like this or I'd never hear the end of it."

Somehow this fellow's pleasant face came before me the other day as I read a passage about the compass written in the 13th century and quoted in *A Short History of Science* by Sedgwick, Tyler, and Bigelow:

"No master mariner dares to use it lest he should be suspected of being a magician; nor would the sailors venture to go to sea under the command of a man using an instrument which so much appeared to be under the influence of the powers below."

Along these lines a friend of mine writes:

"As Schopenhauer said, "the progress of truth goes through three stages: in the first stage it is ridiculed, in the second it is opposed, in the third it is regarded as self evident." I hope it will not take us 100 years to get to the second stage."

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Forecasts of Individual Company Sales

As you know if you have been a member over a period of years, in 1949, in co-operation with about 25 leading American companies who furnished the necessary data, I made a study of the 6-year cycle as it appeared in their sales, income, or production figures.

The purpose of the study was not to forecast the sales of these companies, but to learn more about the 6-year cycle as such.

However, automatically, the study did throw light on future probabilities.

The extent to which the projections have worked out seems to have aroused quite a little interest and brought quite a little credit to the Foundation. The fact that "forecasts" based on one cycle alone impress people as being good shows how low the art of business forecasting really is.

As long as people are going to insist on using these more or less academic 6-year cycle studies as indications of the future, we might as well supplement them with what we know about trend and about other cycles in the sales of these various companies and make the best forecasts we can. This I am proceeding to do, starting in this issue.

Henceforth, therefore, I shall separate the material in regard to the 6-year cycle into two parts. One part, to be printed in our "How It Done Do" Department, will merely record, as a matter of general interest, how the 6-year cycle has worked out in these figures since discovery. The other part will be printed in the Research Department. It will attempt to use a knowledge of the 6-year cycle (and other cycles) to throw light upon the future in a form in which the layman can use it.

Cordially yours,

Edward R. Dewey

Director

Research

CONTINENTAL OIL COMPANY CYCLES, TREND, AND FORECAST

THE 6-YEAR CYCLE IN CONTINENTAL OIL COMPANY INCOME

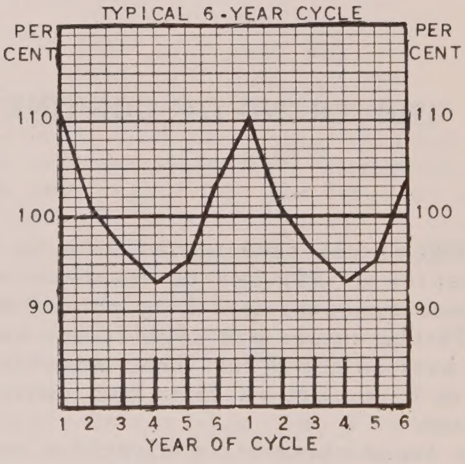
IN 1949 I told you of a 6-year cycle present in the gross operating income of the Continental Oil Company, 1930—1948. Now that we have figures for four more years it is possible to improve the year-by-year values for this cycle given at that time. The revised values of a typical 6-year wave in these figures are as follows:

Year	Strength
Year of crest	110.6% of trend
2nd year of cycle	100.9% of trend
3rd year of cycle	96.4% of trend
4th year of cycle	93.1% of trend
5th year of cycle	95.2% of trend
6th year of cycle	103.8% of trend

A chart of the revised values is given in the next column.

Years of crest remain 1948, 1954, etc. as originally determined.

The time interval from 1930 to date is enough for only 3 1/2 repetitions of this cycle. This is very little to go on. The justification for giving any credence to this cycle in these figures depends wholly upon the presence of a cycle of this length coming at the same time over very much longer periods of time in other figures.



Readers of these reports know that a 6-year cycle is one of the commonest and best substantiated cycles that we have. It is present in commodity prices, security prices, and production figures. It is present in natural phenomena such as barometric pressure, alternate thickness and thinness of tree rings, and sunspots. In tree rings it is present on the average in each group of 181 years from 800 A.D. to date. I am convinced of its significance.

E.R.D.

THE 3 1/2-YEAR CYCLE IN CONTINENTAL OIL COMPANY INCOME

IF you want to know what is ahead for Continental Oil Company, gross operating income, you have to know the cycles that are present in these figures. Without this knowledge you cannot know what the trend is at the present time, nor can you know the deviations from trend to expect for the future.

Immediately above is a brief article giving latest revised figures for the typical 6-year cycle in these figures. With a knowledge of the 6-year cycle you can get a good deal of light in regard to what is ahead. However, there is another cycle also present in this series of figures. It is about 3 1/2 years long from crest to crest. If you take this 3 1/2-year cycle into account also you should be able to do a better job of forecasting.

The 3 1/2-year cycle crests ideally in these figures during 2nd half 1930, 1937, 1944, 1951, 1958, etc, and 1st half 1934, 1941, 1948, 1955, 1962, etc. As we have only annual figures with which to work we must show typical figures for two complete waves in order to reflect this situation. These values are as follows:

Year	Strength
Year of crest	106% of trend
2nd year of cycle	99% of trend
3rd year of cycle	96% of trend
4th year of cycle	99% of trend
5th year of cycle (crest)	106% of trend
6th year of cycle	97% of trend
7th year of cycle	97% of trend

The "year of crest" in the above table refers to 1930 and every 7th year after.

Over six repetitions of a cycle as well-known as the 3 1/2-year cycle would seem ample justification for accepting this cycle as significant for purposes of practical forecasting.

E.R.D.

THE TREND OF CONTINENTAL OIL COMPANY INCOME

TREND is the tendency of data in a series of figures to increase or decrease during a long period of time. If the cycles are significant and if you have adjusted for them correctly, what you have left is trend and random variations.

As a trend changes its direction but slowly, if it has been determined properly it can be projected into the future with a fair degree of accuracy. However, such projections should not be made very far into the future. Moreover, such projections should be revised frequently, just as, in driving a car, you keep bringing it back to the road.

If you adjust the figures of gross operating income of Continental Oil Company from 1930 through 1952 for the effect of the 6-year cycle and the 3 1/2-year cycle you get the result shown in Fig. 1. I have smoothed this result and ventured to project the trend thus obtained as the basis for a forecast of the sales of this company.

I might mention that the residual after removal of the two cycles named above looks as if it were influenced by three more cycles of rather minor importance. So far, I have not had time to isolate these three cycles. Perhaps the statisticians of the company will do this for themselves and let me know what they find. If not, I will try to do this work for you when I revise the forecast next year.

Note that trend is bending over rapidly. That is, gross operating revenue is increasing much less rapidly than formerly. The percentage increase of the underlying growth trend each year compared with the year before, as nearly as I can figure it, for the past several years has been as follows:

1947	123.9% of 1946
1948	123.0% of 1947
1949	117.1% of 1948
1950	111.7% of 1949
1951	107.7% of 1950
1952	104.9% of 1951

Estimates for the future are based on the assumption that the underlying growth trend has been falling off in accordance with the above table and that this characteristic of underlying growth of Continental Oil income will continue as follows:

1953	102.9% of 1952
1954	101.9% of 1953
1955	101.0% of 1954
1956	100.0% of 1955

Keep in mind that I am not here talking about *income*, as such, but about the *trend*—the underlying growth factor remaining when the effect of the cycles has been adjusted for. This is the factor which is projected into the future as an axis around which to wrap the cycles.

E.R.D.

A FORECAST OF CONTINENTAL OIL COMPANY INCOME

A FORECAST of gross operating income of Continental Oil Company is now easy.

Fig. 3 shows the 6-year cycle, the 3 1/2-year cycle, their combination (projected eight years), the trend (projected four years), and the combination of cycles and trend.

Fig. 2 shows (by means of a broken line) this same combination or synthesis in comparison with actual behavior.

A projection based on these two cycles and trend alone indicates income of $420,000,000 for 1953, income of $470,000 000 for 1954, and income of $468,000,000 for 1955. Income for 1956 and 1957 will be much lower, as indicated by the combined effect of the cycles, if they are real and continue.

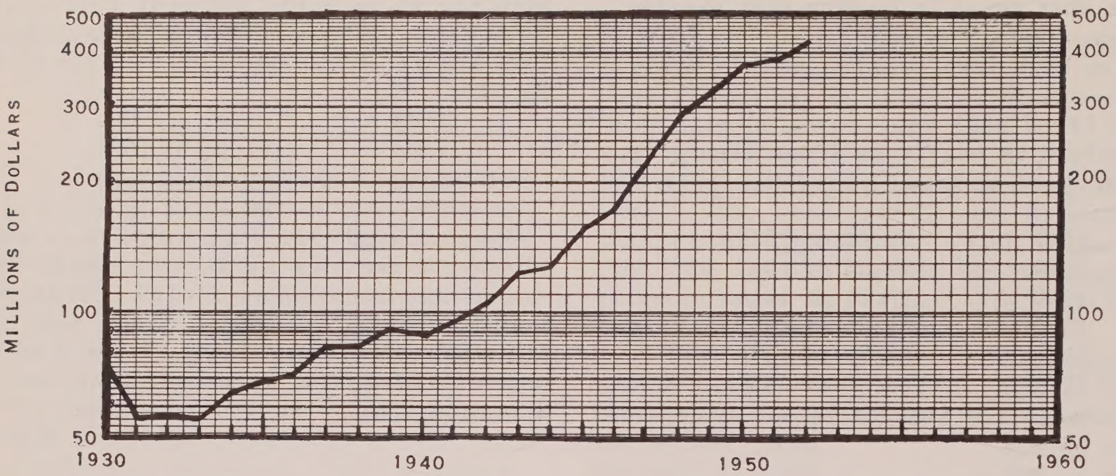
A projection using these two cycles and trend for 1951 and 1952 would have called for income of $386,000,000 for both years. Actual income was $380,000,000 and $397,000,000 respectively. The projection would have been 1.6% too high for 1951 and 2.5% too low for 1952. This error would have been due in part to one of the shorter cycles mentioned in the sections on trend. At a guess, approximately the same error would be present in the projection named above. Hence, my forecast, modified to take account of this factor, is as follows:

1953	$414,000,000
1954	$483,000,000
1955	$461,000,000
1956	$416,000,000

I do not mind sticking my neck out, but I do not want to fool you into thinking I know more than I do. The forecast above was made *entirely without use of brains*. It takes into account only the regularly recurring cycles of the past and an estimate of trend based upon the assumption (a) that the cycles are real and are continuing and (b) that present trend characteristics will continue. You are probably better able than I to make an estimate of the non-rhythmic factors which might enter into the situation.

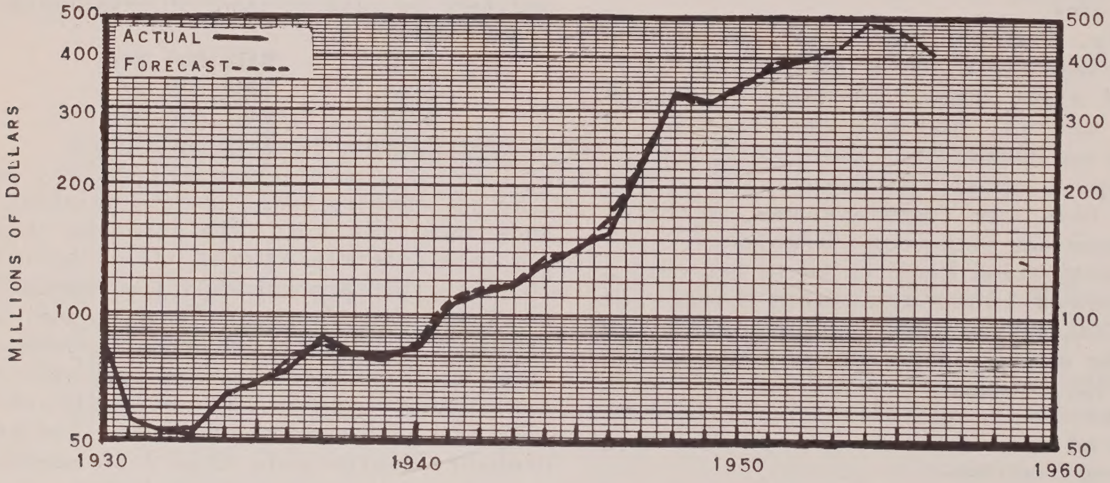
E.R.D.

Fig. 1 Continental Oil Company



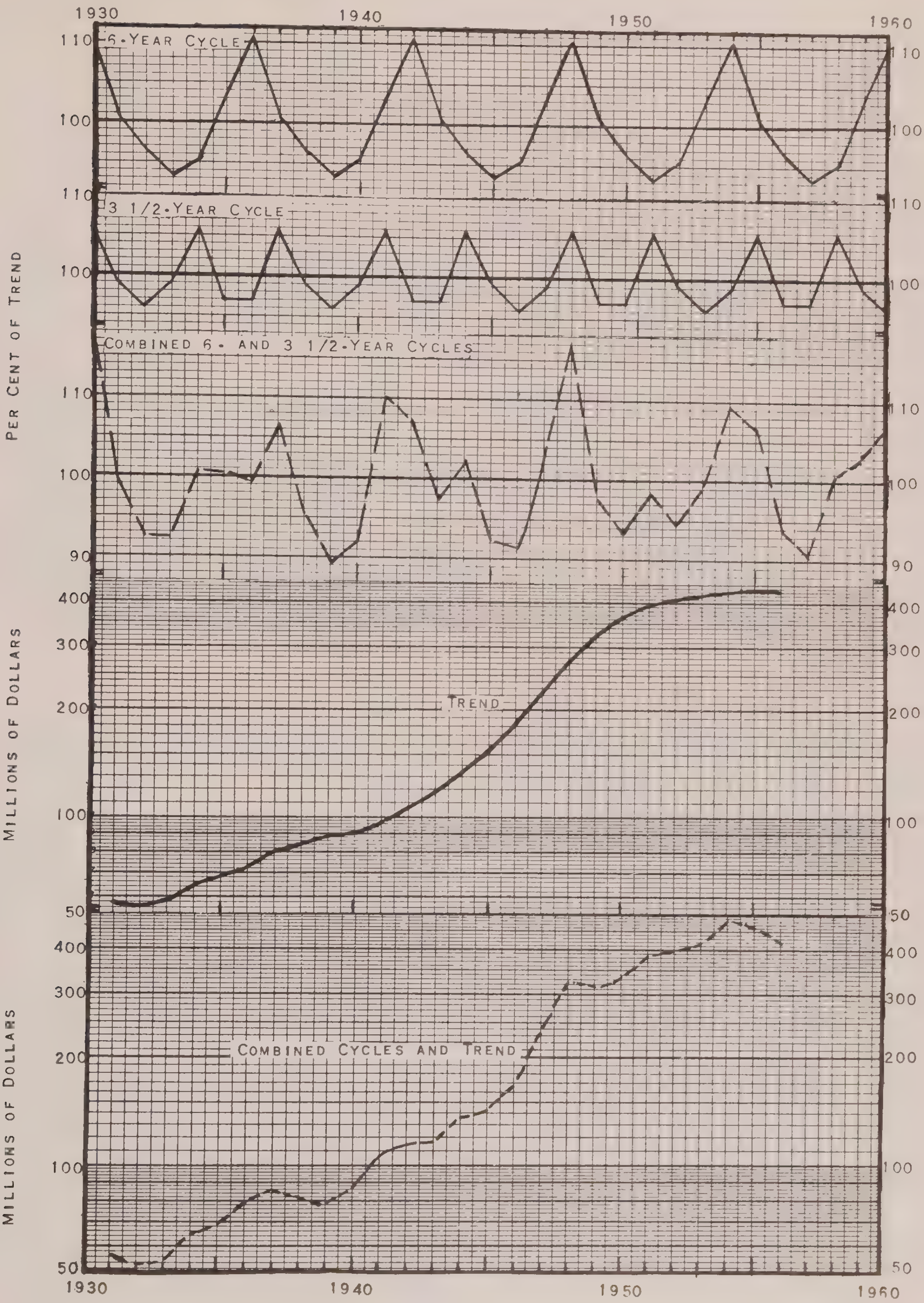
INCOME ADJUSTED FOR THE 6-YEAR CYCLE AND THE 3 1/2-YEAR CYCLE.

Fig. 2 Continental Oil Company



ACTUAL INCOME VS. FORECAST (FORECAST IS COMBINATION OF THE 6-YEAR CYCLE, THE 3 1/2-YEAR CYCLE, AND TREND.)

Fig. 3. Continental Oil Company



THE 9.3-YEAR CYCLE IN GRASSHOPPER OUTBREAKS

THE well-known "10-year" cycle in grasshopper outbreaks proves, on more accurate measurement, to average about 9.3 years long, from crest to crest or from trough to trough. The next year of maximum outbreak is due ideally (for the country as a whole) about 1958; the one after that about 1967.

Because the abundance of so many animals fluctuates in a 9.6-year cycle, biologists will be surprised that the grasshopper cycle is not 9.6 years long also. However, the grasshopper cycle is clearly shorter, and we must take facts as we find them.

The strength or amplitude of this cycle is tremendous. It runs from 45% of trend at time of trough to 233% of trend at time of crest.

This study is based upon data contained in a paper by Dr. J. R. Parker, in charge, Laboratory of Grasshopper Research, U.S. Department of Agriculture. The paper is called, "Grasshopper Outbreaks During the Last 100 Years." This paper lists by state the "Severe" and the "Less Severe" outbreaks. With Dr. Parker's advice a value of four has, somewhat arbitrarily, been given to each "Severe" outbreak, and a value of one to each "Less Severe" outbreak, to create a crude Index of Grasshopper Abundance. This Index, with a value of .25 arbitrarily given to those years with no outbreaks, has been plotted in Fig. 1 on the following page. The scale is shown both in logs and in index numbers. Fig. 2 shows the Index expressed as percentages above and below trend. In both instances a perfectly regular 9.3-year periodicity has been added.

Dr. Parker's data end in 1940 and, as I do not keep up with grasshopper outbreaks, I do not know whether the 1947—49 outbreak forecast by the concept of a 9.3-year cycle came true or not.

In making this study it became clearly evident that in addition to the 9.3-year cycle there is a second and even more important cycle of about 21 years from crest to crest present in these figures. However, this second cycle has not yet been isolated.

Significance

Significance For You:

1. Relatively few and/or light grasshopper outbreaks are indicated for 1953, but thereafter, for the next few years, increasing number and severity of grasshopper outbreaks are to be expected until about 1958.

2. You are concerned with grasshoppers whether you know it or not. "Crop losses and expenditures for control directly traceable to the migrating swarms in 1938 and to their progeny in 1939 and 1940 have exceeded $30,000,000." This loss affects every one of us, and particularly those in grasshopper areas.

3. The important thing seems to be to *time* the outbreaks so that the grasshopper can be poisoned *before* the crops are attacked.

4. The 9.3-year cycle reported upon here and the 21½-year cycle to be reported upon at a future time are first steps in the direction of accurate advance timing of outbreaks.

Significance for Cycle Study:

1. A cycle which has repeated with the indicated regularity and dominance over as many repetitions cannot easily be the result of chance.

2. If the force causing this behavior is environmental, it should be possible to get clues by finding what environmental factors fluctuate with a rhythm of this length.

In the meantime, we need to investigate what other biological and social science phenomena fluctuate with a 9.3-year cycle. Lane finds a 9.3-year cycle in sunspots, and I have found it in the sales of a large manufacturing concern and in wheat prices and pig iron prices, but where else is it?

E.R.D.

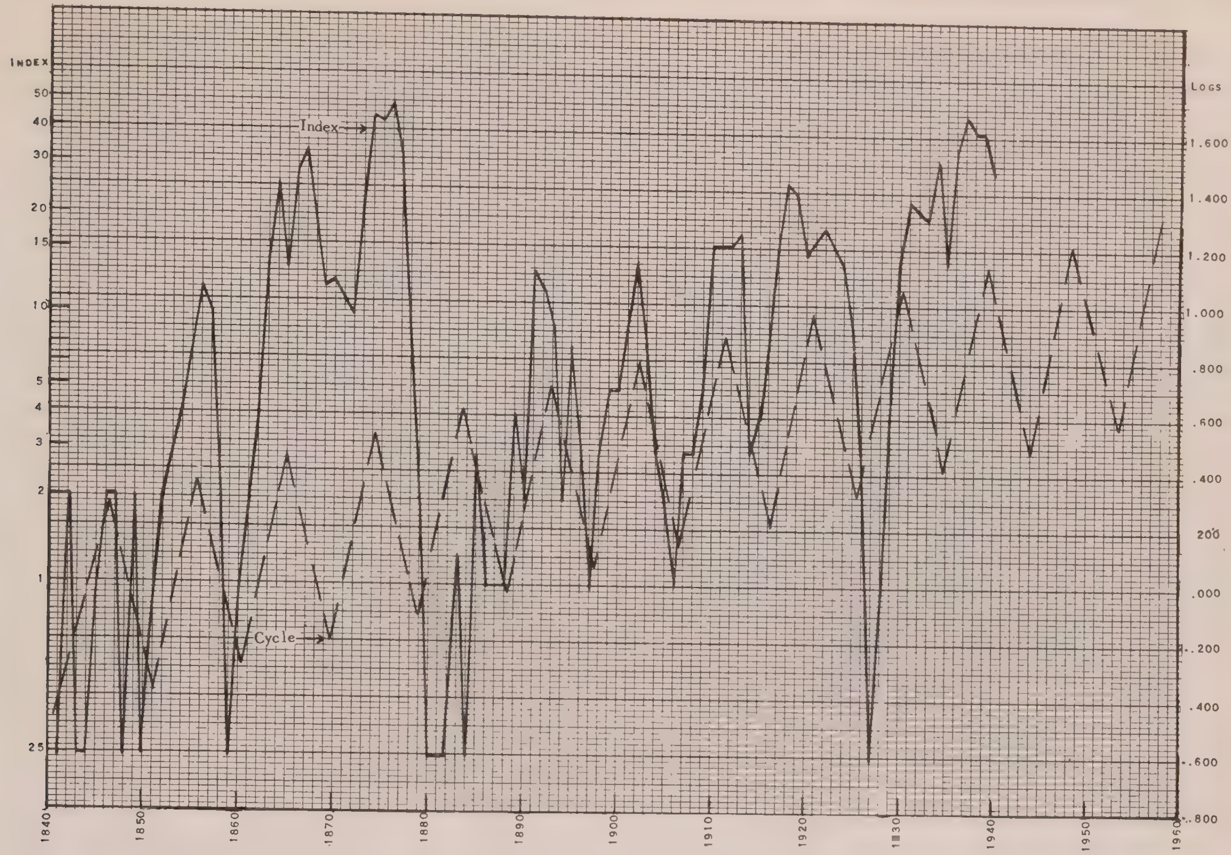


Fig. 1. Index of Grasshopper Outbreaks, 1841-1940, and the Ideal 9.3-Year Cycle.

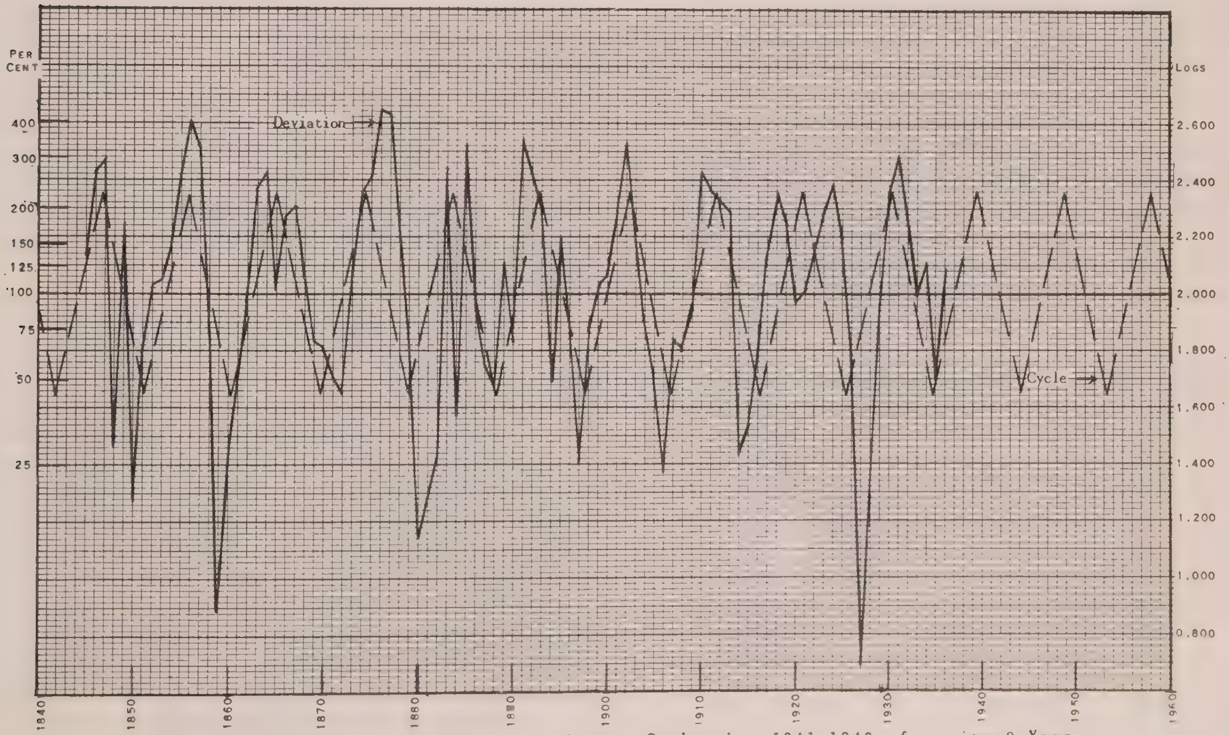


Fig. 2. Deviations of Index of Grasshopper Outbreaks, 1841-1940, from its 9-Year Moving Average and the Ideal 9.3-Year Cycle.

45 6/7-DAY CYCLE IN A COMMON STOCK

ONE of our members, who wishes to be known merely as Mr. Grand, has isolated an important 45 6/7-day (6.55-week) cycle in a common stock in which he is interested.

If I told you the name of this stock you might trade it to the point that you would obliterate this cycle. To protect Mr. Grand I must therefore keep the name of this stock a secret. But, by knowing length and timing of this cycle, you can easily see if the stocks in which *you* are interested behave the same way.

Step-by-Step Procedures Available

A lengthy correspondence with Mr. Grand, showing step by step just how he proceeded to discover and isolate this cycle, and showing all his work papers, may be printed for you in the *Journal of Cycle Research* as another example of cycle analysis, worked out in complete detail, for the information and guidance of those who wish to do this sort of thing for themselves.

Timing of the Cycle

Mr. Grand's cycle crests ideally on February 6, 1953 and every 45 6/7 days from then, as nearly as Mr. Grand is able to measure it from the data available to him. This would put ideal crests and troughs at the following days in 1953:

IDEAL 45 6/7-DAY CYCLE IN MR. GRAND'S STOCK

DAY OF CREST	DAY OF TROUGH
	1-16-53
2- 6-53	3- 3-53
3-24-53	4-18-53
5- 9-53	6- 3-53
7- 4-53	7-28-53
8-18-53	9-12-53
10- 3-53	10-28-53
11-18-53	12-12-53

Other phenomena in which this cycle is present might have ideal crests or troughs earlier or later than in Mr. Grand's stock.

The terms *time of ideal crest* and *time of ideal trough* may need explanation. These terms refer to the turning points of the perfectly regular cycle to which the actual behavior more or less corresponds. Ideally the coldest day of the annual temperature cycle at New York City comes, let us say, at February 1st. This, we will suppose, is the date of the *ideal* low, but the *actual* low in any one year may come from December to March. February 1st may, in fact, be a nice warm day. But if, at this time, you have to guess the date of the coldest day of the winter of 1953—54 it is your best bet. In any event, it is likely to be colder than August 1st.

12.4% Per Annum Profit

Similarly, with Mr. Grand's cycle, the peaks may not come on the days indicated. In fact, they probably will not. But if you have to pick one particular day on which to buy and one on which to sell, the days indicated are your best bet. At all events, if the cycle continues to operate in the future as it has operated in the past, on the average the days of crest will be enough above the days of trough to give you a gain of 12.4% per annum, without margin, and disregarding taxes and brokerage. This, I think, is quite good for just one short cycle by itself.

Significance

Significance For You:

1. Just as Columbus' sail to the West proved that the "Indies" *could* be found, Mr. Grand's work shows you (if you did not know it already) that there *are* short cycles in economic affairs. Fifteen repetitions of a cycle as dominant and as regular as this one in this series of figures cannot easily be the result of chance.

2. The fact that a novice at cycle analysis like Mr. Grand could find something of the sort without difficulty, using the instructions which we have been giving, should encourage you to do the same sort of thing with your own figures

and the figures of securities and commodities in which you are interested.

3. Knowing the exact length and timing of this cycle in Mr. Grand's stock should be of considerable assistance to you, if you seek this cycle in your own field of interest.

4. The above article tells you where you can obtain a fully worked out step-by-step example of exactly how Mr. Grand found this cycle—so that you can do likewise.

5. The final significance and value for you of the above discovery is the fact that with a cycle as short as this you will not have to wait very long to see if it keeps on coming true. By this time next year this cycle will have had an opportunity to repeat about 8 times. With Mr. Grand's cooperation I shall tell you whether or not it actually did.

Significance for Cycle Study:

1. This discovery of Mr. Grand gives us an example of a short length cycle in economic affairs which has repeated enough times and with enough dominance and regularity so that it cannot easily be the result of chance.

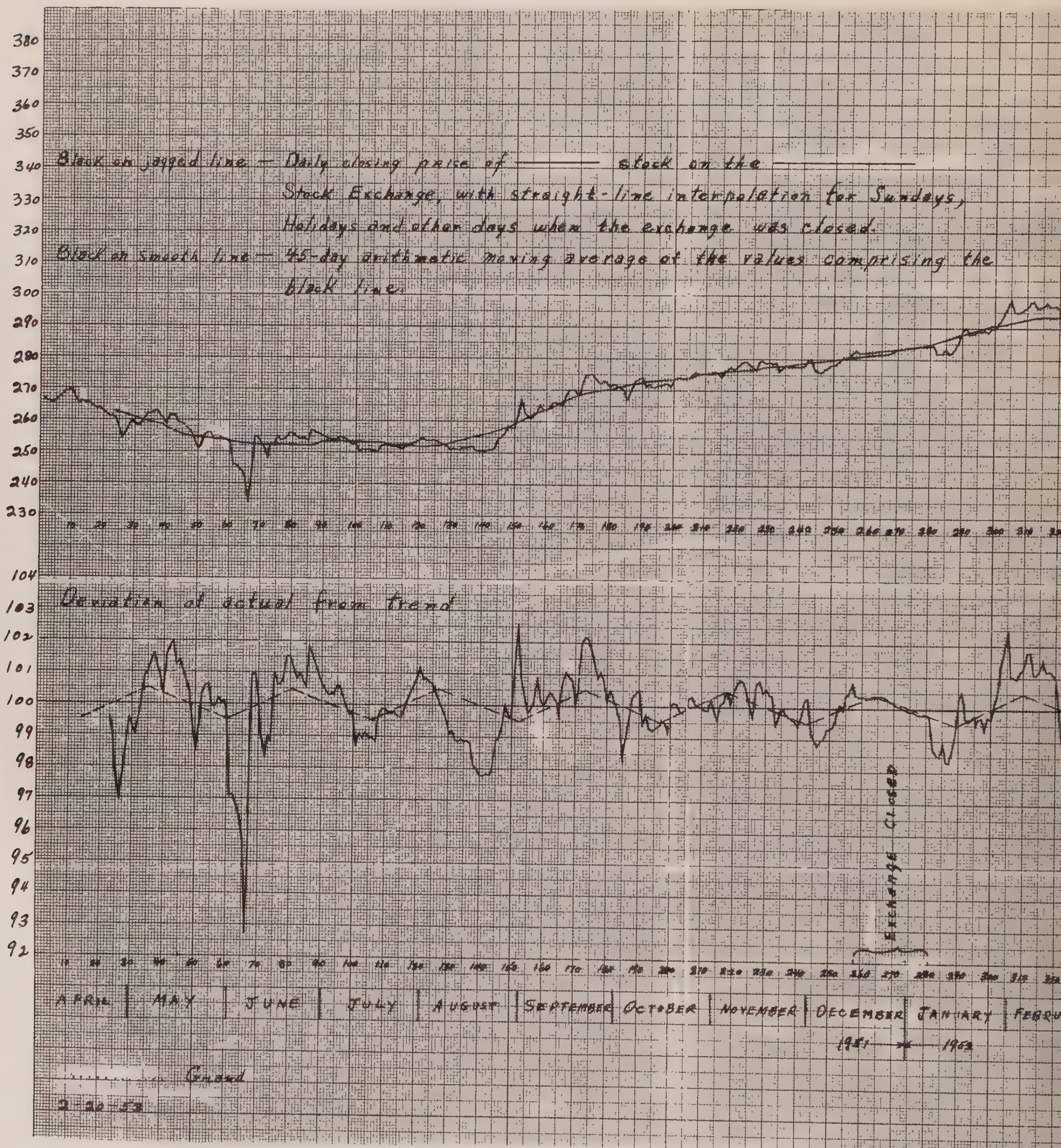
If Mr. Grand's cycle is not the result of random forces, it may continue and we will have learned of behavior of great importance.

Where we have a cyclic result not the result of random forces we have a right to assume the possibility of a cyclic cause. If the cyclic cause is environmental it can be expected to make other things fluctuate with a cycle of similar wave length. If the cyclic cause is in physical nature we would expect that natural phenomena such as rainfall, ozone content of the atmosphere, terrestrial magnetism, barometric pressure, might show similar variations.

Conversely, if we do have cycles of this length in natural phenomena we can assume that Mr. Grand's cycle may have had an environmental cause, and we can start to run down what that environmental cause might be.

The job ahead is to do some sleuthing to see what other sorts of thing, if any, go up and down with a cycle of this length.

E. R. D.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Black on smooth line — 45-day arithmetic moving average of the values comprising the black line.
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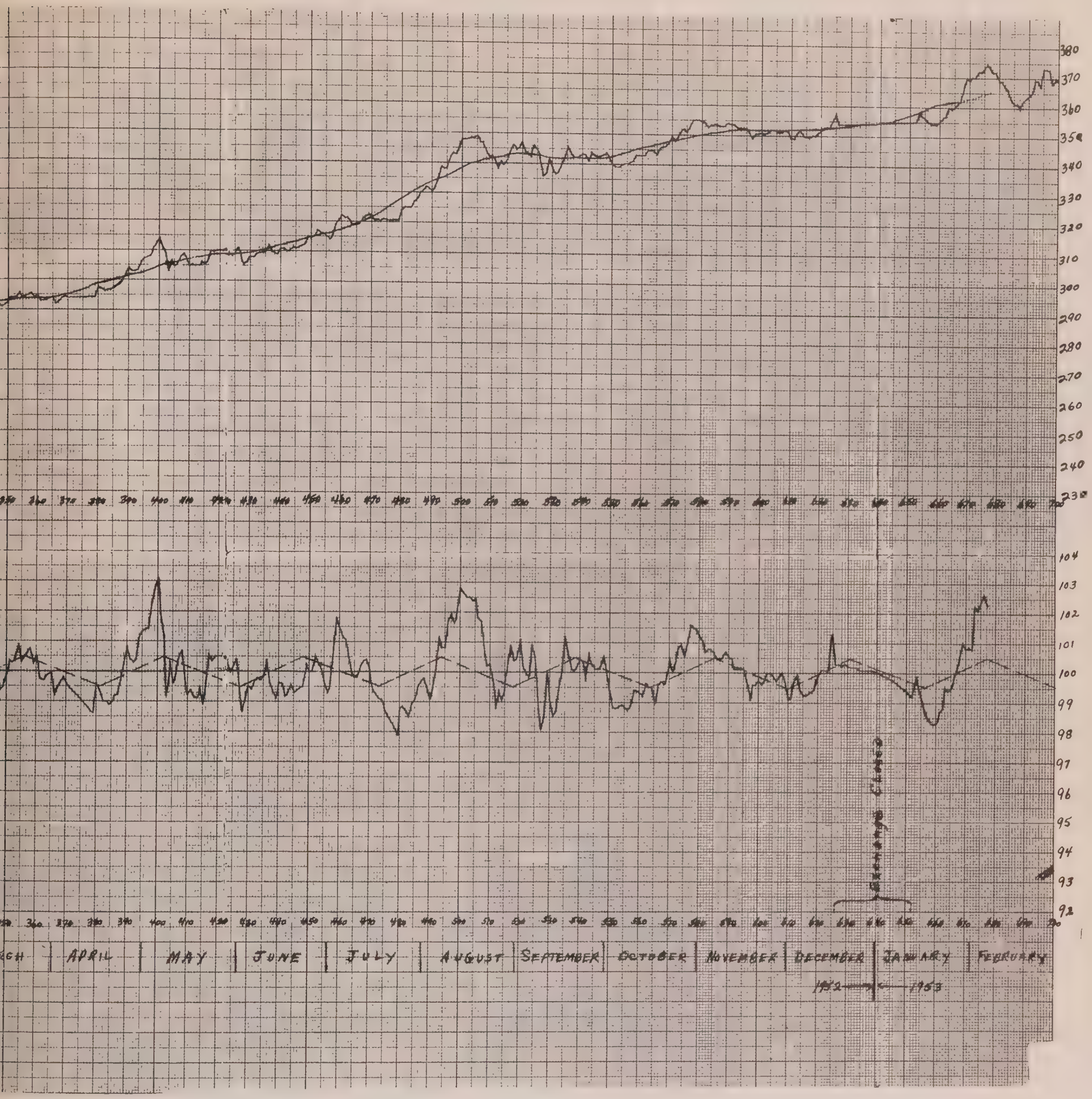
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WHAT'S AHEAD FOR WHEAT PRICES?

LAST month I told you of a 9.3-year cycle in wheat prices. It is diagrammed for you in Curve B in Fig. 2 on the two-page spread next following. There is also a 7.5-year cycle present in wheat prices as diagrammed in Curve C in Fig. 2. I shall say more of the 7 1/2-year cycle in wheat prices at another time. For now it will be enough to say that a crest of the 7.5-year cycle in wheat prices came ideally in April 1950, that it has an amplitude of 109.9% at crest, 90.1% at trough. The combined effect of the two cycles projected to 1970 is shown in Fig. 2, Curve D. The 7 1/2-year cycle *influences* the stronger 9.3-year cycle but does not *dominate* it.

So that you can use a knowledge of these two cycles to the greatest advantage I need to use a few paragraphs to explain the other factors that go into the price of wheat.

1. The Inflation Factor

One of the most important elements in the present price of wheat is inflation. Inflation results from the fact that our government has watered our money so that it now takes about twice as many dollars to buy things as it used to. It is exactly the same as if your milkman watered your milk so that you had to drink two quarts of the half-water and half-milk to get the same nourishment you used to get from one quart of full-strength milk. (If you ever drank a glass of half water and half milk

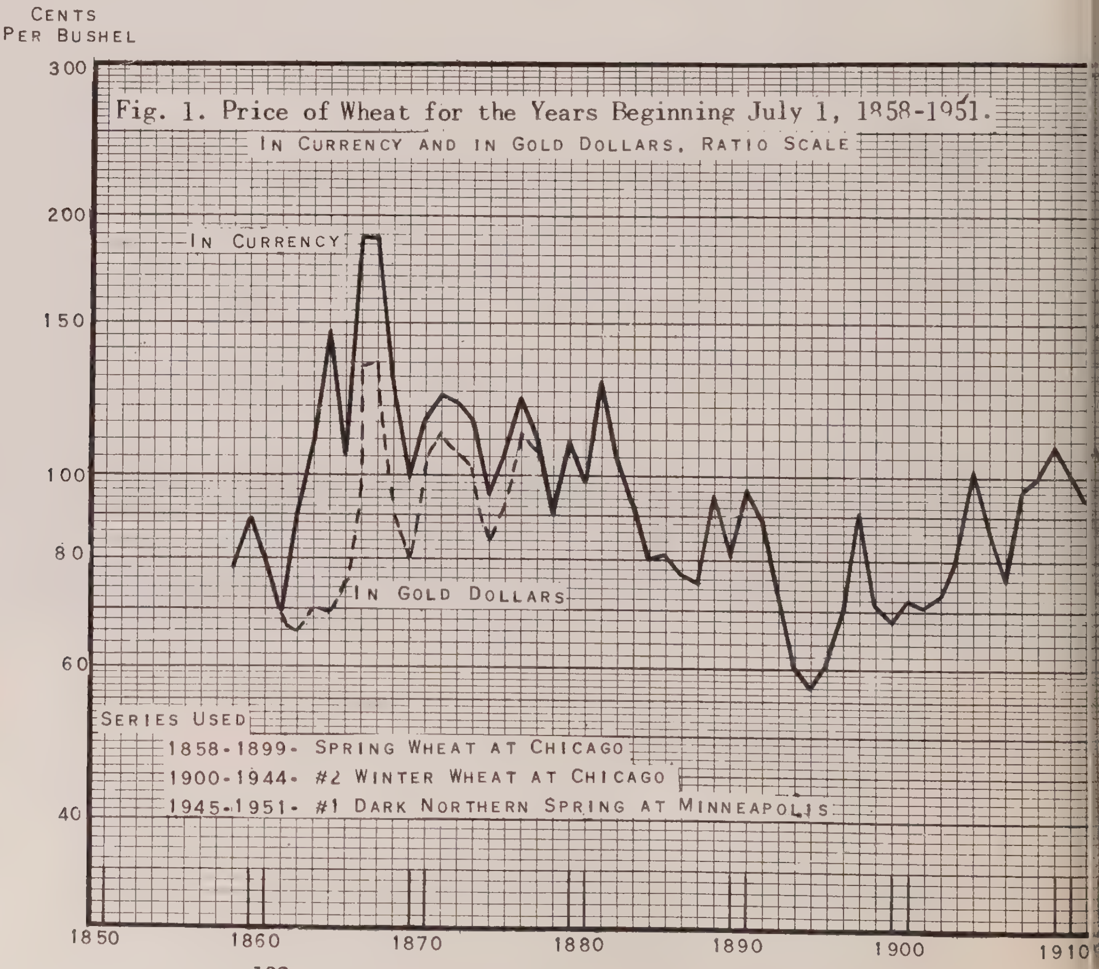


Fig. 1. Price of Wheat for the Years Beginning July 1, 1858-1951.

In Currency and in Gold Dollars, Ratio Scale you will know exactly how I feel about our present currency.)

We have had watered currency since we went off the gold standard in 1933. We also had watered currency during and after the Civil War.

Prices on a Gold Basis

There are different ways of measuring inflation, but the usual way is to convert prices to a gold basis. With wheat, for instance, if the price is $2.00 a bushel in paper money and if it takes two paper dollars to buy a gold dollar, the price of wheat *in gold* is $1.00 a bushel. The problem is a little complicated since 1933 because buying and selling gold coins is illegal. There are, however, black market quotations and I have used these as a basis for making the necessary adjustments.

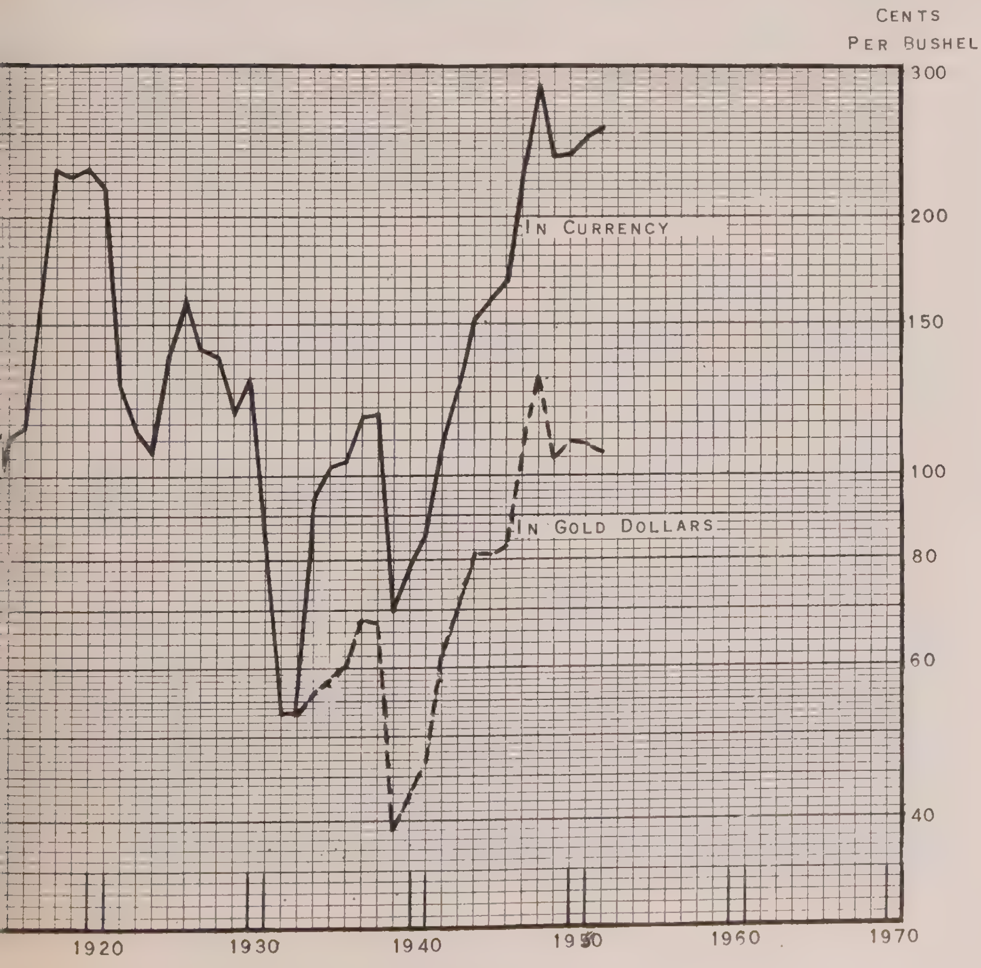
The black market price of gold coins for this study were provided by Pick's World Currency Report of 75 West Street, New York City, a research organization specializing in statistical information on black, gray, and white market prices of currency and precious metals.

Wheat prices by crop years 1858-59 through 1951-52 in both currency and gold are shown in Fig. 1 below.

That part of wheat prices 1861-2 to 1878-9 and 1933 to date due to the watering of our money is shown by Curve A in Fig. 2 on pages 184 and 185.

The Future of Inflation

You know just as much as I do, and probably more, about the probable future course of inflation. Just because I know something about cycles does not make me an authority on inflation, Flemish art, airplane engines, or the barber's itch. I do know that the black market price of gold dollars dropped from $2.47 in 1951 to $2.25 in 1952. I know that we now have a conservative administration which is



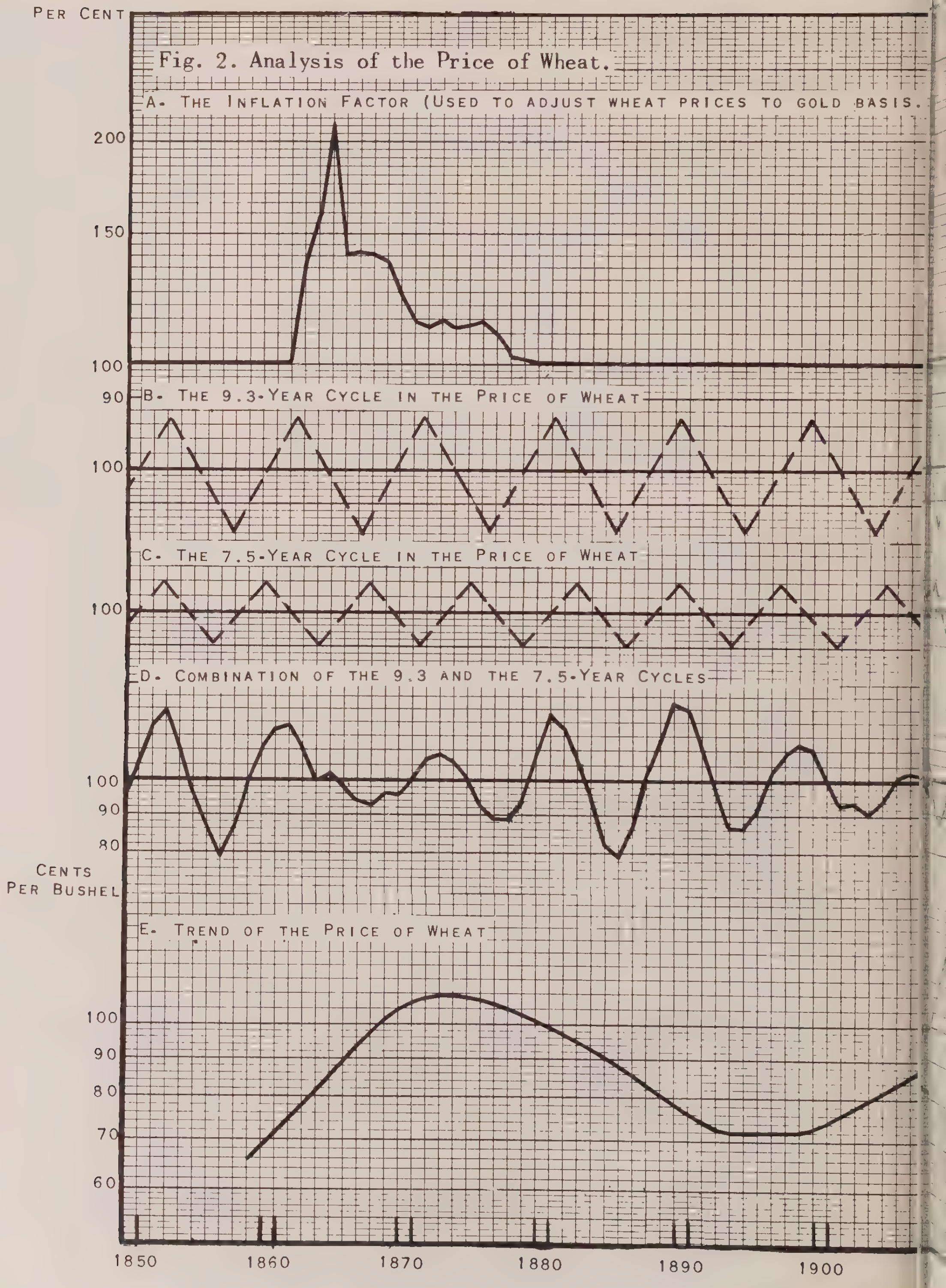
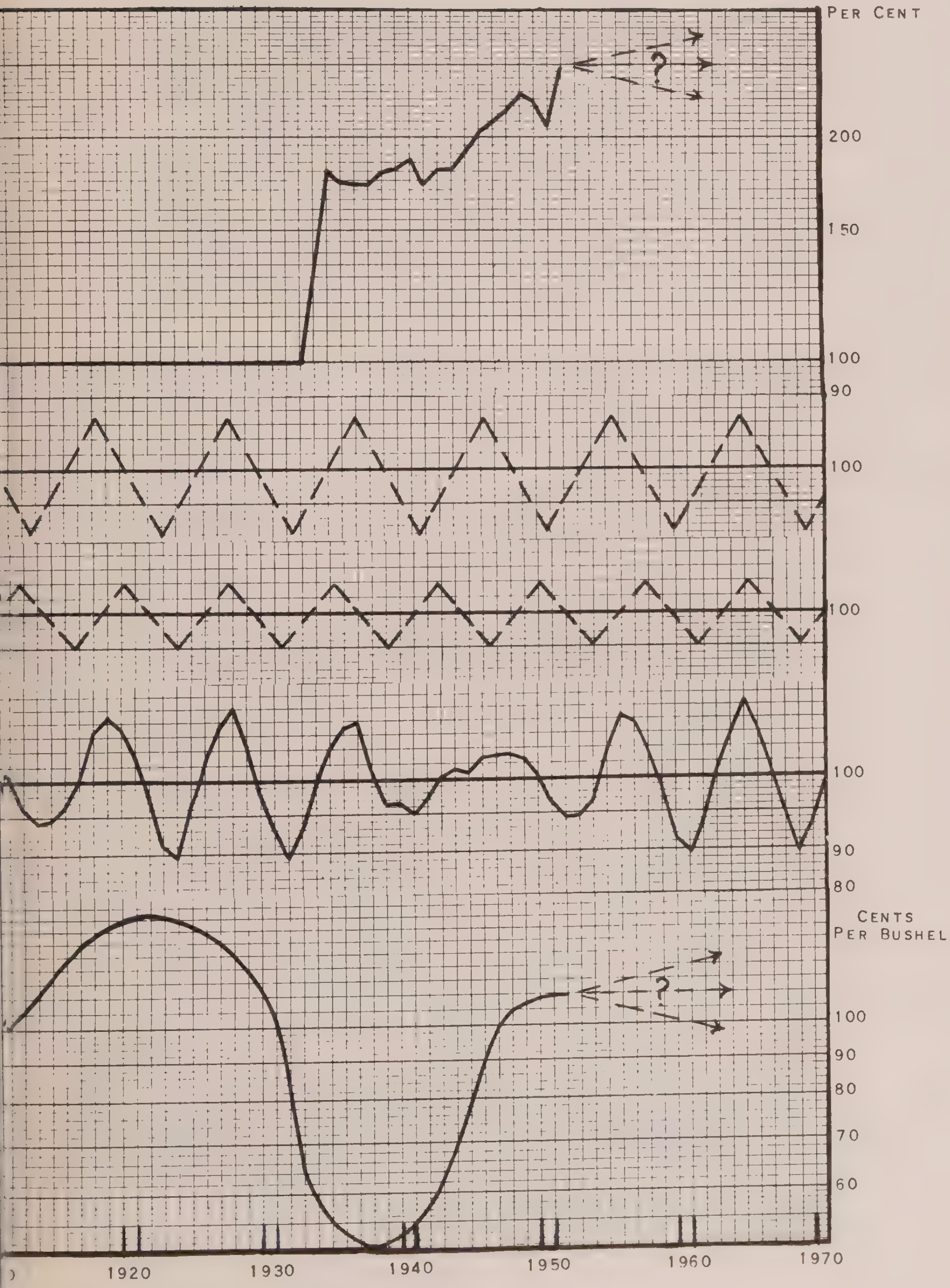


Fig. 2. Analysis of the Price of Wheat.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pledged to honest fiscal policies. My own personal guess is that inflation will probably decrease gradually until World War III, but there are no regularly recurring cycles that I know about in inflation, and, I repeat, your guess on the future course of inflation is as good as mine.

2. The Trend Factor

The second factor entering into the price of wheat is trend—the basic underlying element which changes only gradually from year to year and is independent of year to year variations such as acreage planted, crop yield, weather, carry over, and all the other elements of supply and demand or whatever it is which causes the short-term oscillations of wheat prices. This trend factor, as best I can determine it, is charted in Fig. 2 as Curve E.

If you are an expert on wheat prices maybe you know what makes the trend. I suppose basic changes in governmental policy in respect to subsidy for the wheat voters, either direct or through loans or export allowances or what not, have a bearing. The gradual change in the availability or fertility of acreage, here and abroad, might have something to do with

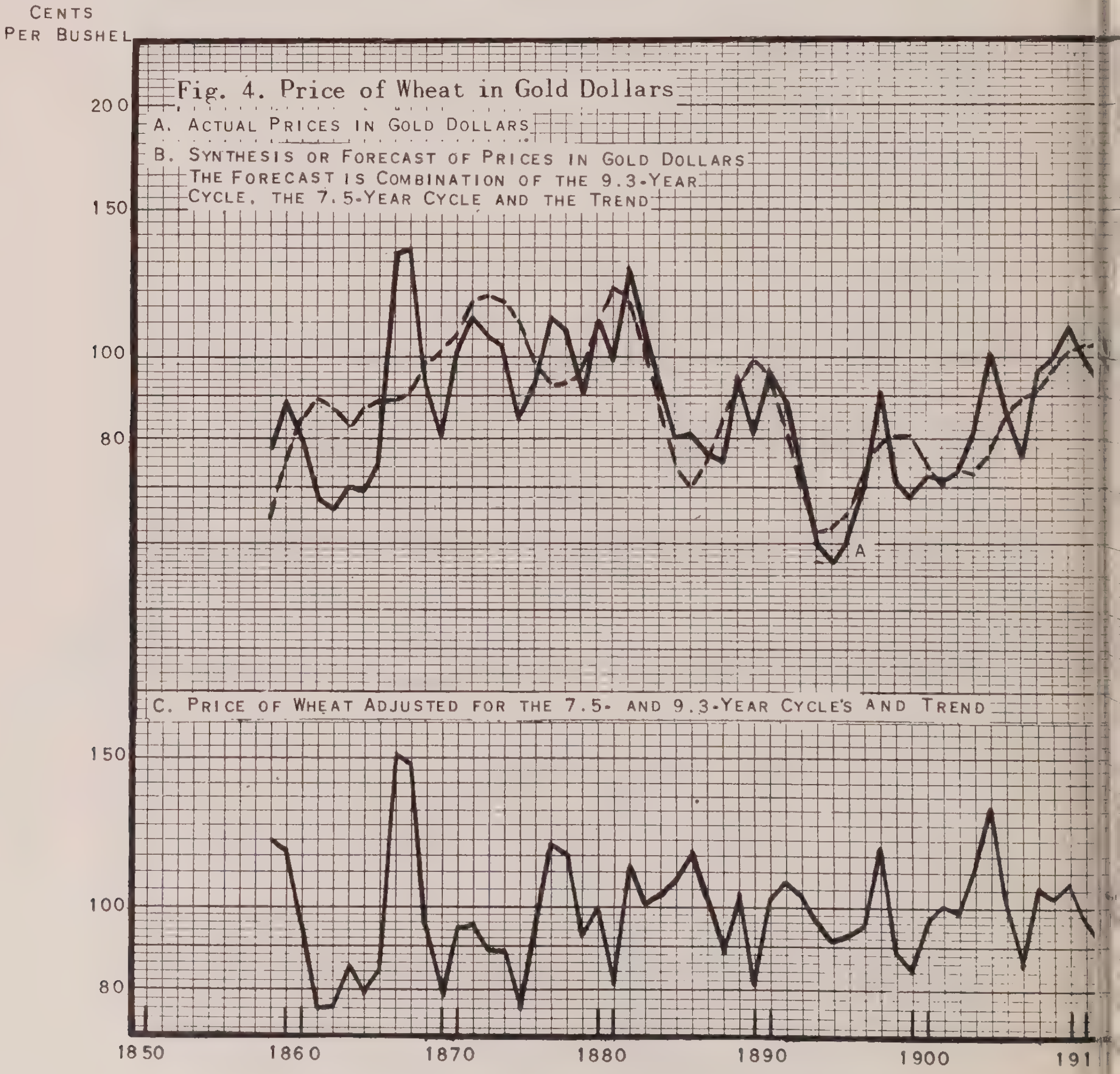


Fig. 4. Price of Wheat in Gold Dollars

it. So might trends of dietary custom. Or long-term cycles of which, as yet, we know very little.

I do not know what the basic underlying wheat price trend is going to do. But I can call your attention to two facts about it as follows:

One, the rise in the basic underlying trend of wheat prices (in gold) from 1937-38 to date is greater, percentagewise, than the great rise from 1895-96 to 1921-22.

Two, The basic underlying trend of wheat prices in terms of gold is flattening out, and has been since 1945-46. It may still be rising a little. It may have become flat. It may even have started to go down. It will be three or four more years before we can be sure one way or the other.

Wheat prices (in terms of gold) adjusted for the effect of the 9.3-year cycle and the 7.5-year cycle, 1942-43 through 1951-52, together with my estimate of trend, are shown in Fig. 3. When we know one or two more of the cycles in wheat the residual will be closer to trend and the estimate of trend can be improved. It is worth repeating that you have to know *all* the cycles before you can know the trend.

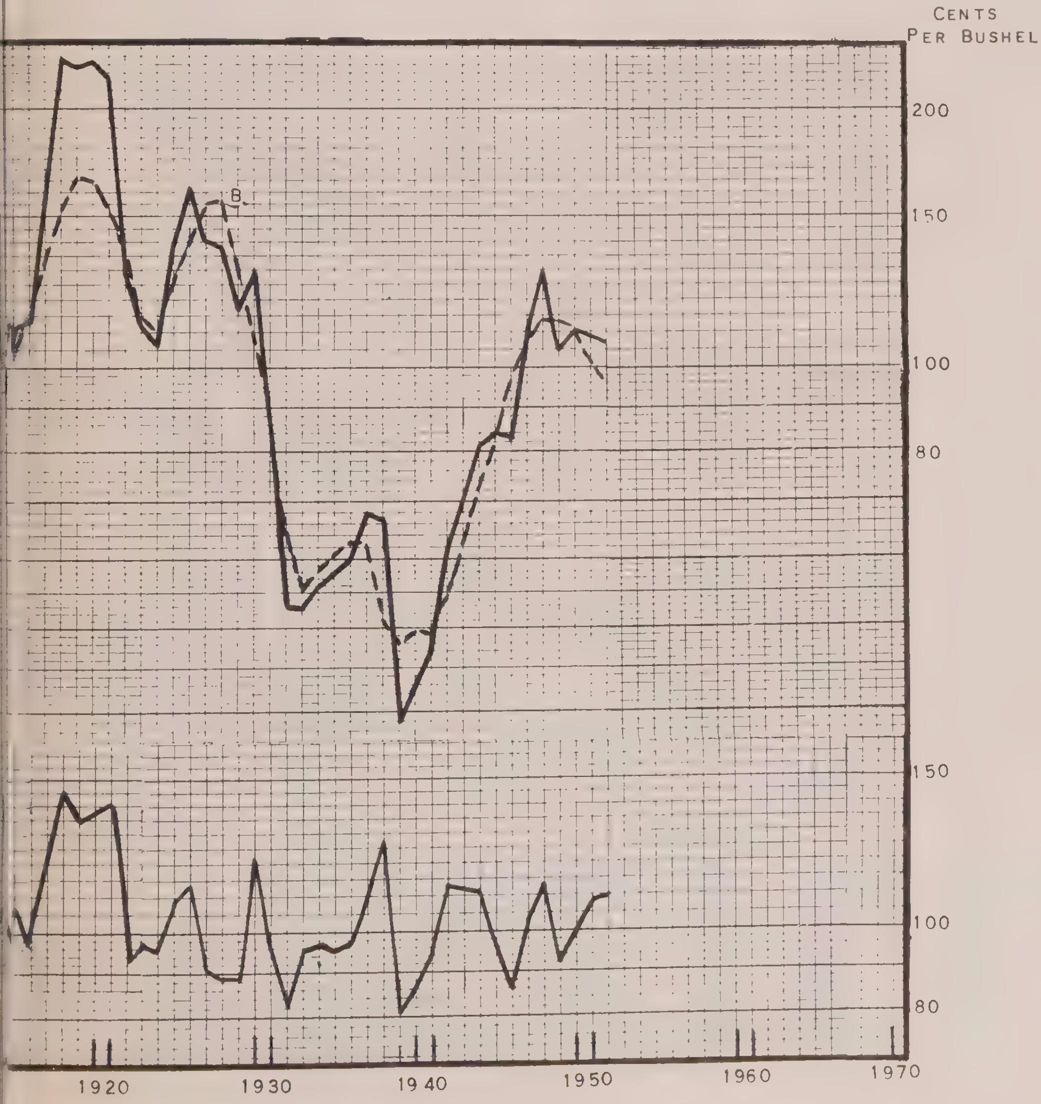
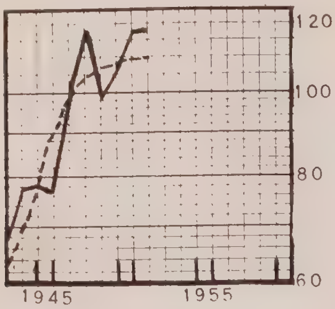


FIG. 3. WHEAT PRICES IN GOLD DOLLARS ADJUSTED FOR 9.3-YEAR AND 7.5-YEAR CYCLES TOGETHER WITH TREND LINE.



3. The Cyclic Factor

Wheat prices also act as if they were influenced at one and the same time by several cyclic forces. One of these is the 9.3-year cycle of which I told you in May. A second cyclic force is the 7.5-year cycle which I have isolated during the past month and of which I shall speak at greater length at a later time. As said above, the typical 9.3-month cycle is shown in Fig. 2 as Curve B. The typical 7.5-year cycle is shown in Fig. 2 as Curve C. Their combination is shown in Fig. 2 as Curve D.

I am convinced that neither the 9.3-year cycle nor the 7.5-year cycle are the result of random forces. I am counting on both to continue.

There seem to be a number of other cycles also present in wheat prices. I want to tell you about them also in future reports.

The combined effect of the 9.3-year and 7.5-year cycles in wheat prices (in gold) calls for a low of 88.5% of trend in 1951-52 advancing to a high of 122.2% of trend in 1955-56 and declining to a low of 79.4% of trend in 1960-61. From now on these two cycles will start to get in step with each other again.

4. Random Factors

Cycles and trend do not always govern. There are random elements that enter into the picture too. Sometimes these are very important, as in the distortions caused by World War I. These random elements (and shorter cycles not yet isolated) have often caused the peak of the cyclic moves to come early or late. A chart of the random residue, as yet unpredictable by a knowledge of cycles, is shown in Curve C of Fig. 4. These irregularities can be expected to recur in the future as in the past. Our forecast must therefore be cast in terms of *probabilities*. If the cycles have prevailed over the randoms to such and an such extent in the past, we can hope for a similar percentage in the future.

The extent to which trend and the 9.3- and 7.5-year cycles in combination have conformed to actual prices in terms of gold is shown in Fig. 4, Curves A and B. Curve A, the solid line, shows actual price of wheat, 1858-59 through 1951-52 in terms of gold. Curve B, the broken line, shows the synthesis of trend and cycles for the same period.

The Future:

Study of Fig. 4 shows that except for the move from 1858-59, where we do not have enough data to know what really did happen, every upward move of combined cycle and trend has had its counterpart in moves of actual prices. Even the cycles themselves prevailed, unaided by trend.

Study of Fig. 4 also shows that in only one case (1867-68) did the crest of the move come more than two years one way or the other from perfect timing.

As a crest of the synthesis of the two cycles is due in 1955-56 we can therefore say that, unless there is *drastic* deflation or a *drastic* change in the basic underlying trend of wheat prices, and if the cycles of the past continue, there is a very strong probability of an important upward move from the low due ideally in 1952 (and which, according to past experience will come *at worst* within two years from that time) to the high due ideally 1955-56 (and which, according to past experience will come (9 to 1) within two years forward or backward from ideal timing).

In other words, looking at the broad picture, things look good for wheat prices for the near future, but bad for the last half of the decade. Readjustments in government subsidy should be made now, while the natural upward forces can cushion them, and the subsequent decline in prices, when it comes, should be blamed not on the new policy, but on the cycles.

E.R.D.

How it Came Out

PREDIX INDUSTRIAL COMMON STOCK ANALYSIS

A year ago last spring, Mr. Vedder Hughey of Coral Gables, Florida, writing under the pseudonym PREDIX, combined and projected into the future a number of cycles which he had found in stock market figures. We published Mr. Hughey's charts in our March, April, and May 1953 reports.

How did Mr. Hughey's forecast work out? You can see by looking at the chart below.

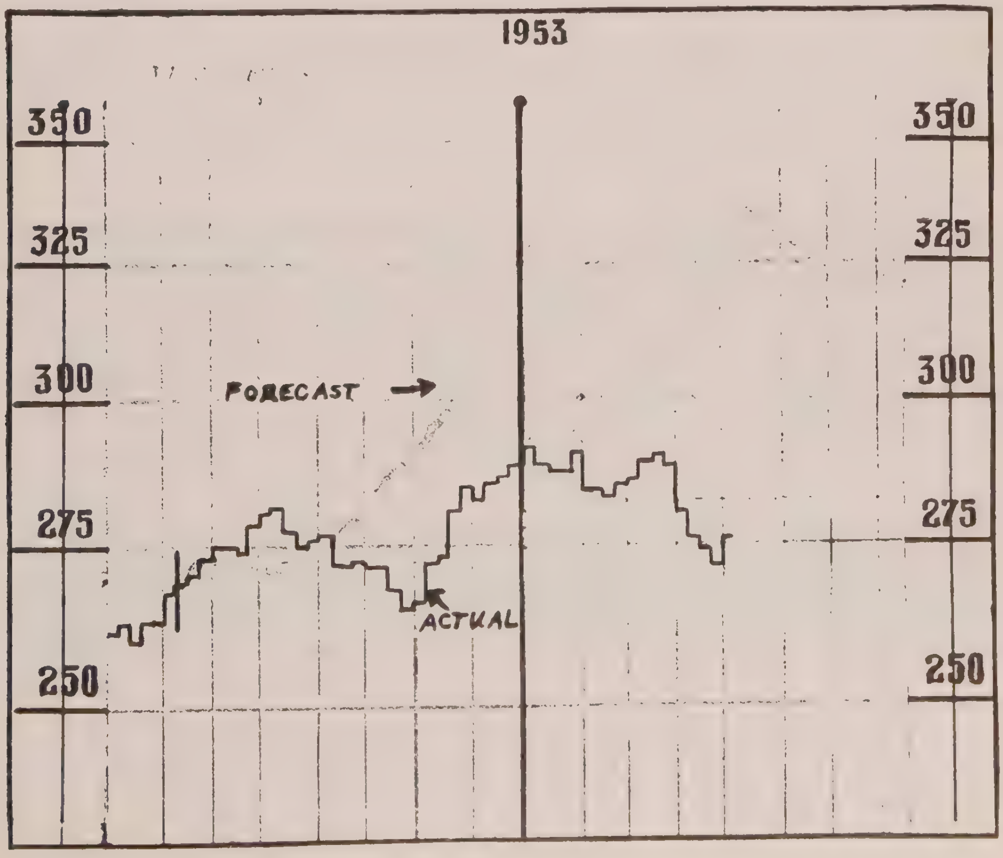
The sum of the long-term trend plus all 39 cycle components was shown as a heavy solid line called, "The Theoretical Forecast."

But as, in June 1952, the Theoretical Forecast was below the actual market, Mr. Hughey also gave a compromise or "Practical Forecast."

Mr. Hughey's Practical Forecast was made by starting the forecast at the level of the June 1952 market and having it gradually approach the level of the Theoretical Forecast while paralleling it at every point.

Actual behavior of the market, week-by-week from the time the forecast was made in comparison with the Practical Forecast is shown by the step-graph.

E.R.D.



THE 6-YEAR CYCLE IN CONTINENTAL OIL INCOME

FIGURES for the gross operating income of the Continental Oil Company are available from 1930 and are charted in Fig. 1 below.

In 1949, using figures through 1948, I observed a 6-year cycle in these figures. I showed lantern slides of my charts to members on my 1949 trip. I also printed them in my report of December 1950.

Crests of the Ideal Cycle

Crests of the 6-year cycle in these figures come ideally in 1930, 1936, 1942, 1948, 1954, and so on. That is, these are the dates of the perfectly regular 6-year pattern which most nearly corresponds to observed behavior.

The 6-year pattern can be seen most clearly when the actual values are expressed as percentages of a 6-year moving average trend, as in Fig. 2. This procedure loses three values at each end of the series of figures, because a 6-year moving average trend cannot be computed beyond that point. Thus, in 1949, the last year for which we could know *for sure* how the 6-year cycle was coming out was 1945. In 1953 the last year for which we can know *for sure* is 1949.

Four More Values Now Available

The four additional values (1946, 1947, 1948, and 1949) which can now be computed are shown in Fig. 2 by means of a heavy black line so that you can see how this cycle has been unfolding.

The low, due in 1945, came one year late. The high, due in 1948, came exactly on time.

For an article making use of a knowledge of the 6-year cycle in an attempt to throw some light on the future of Continental Oil Company gross operating income, refer to page 171 of this report.

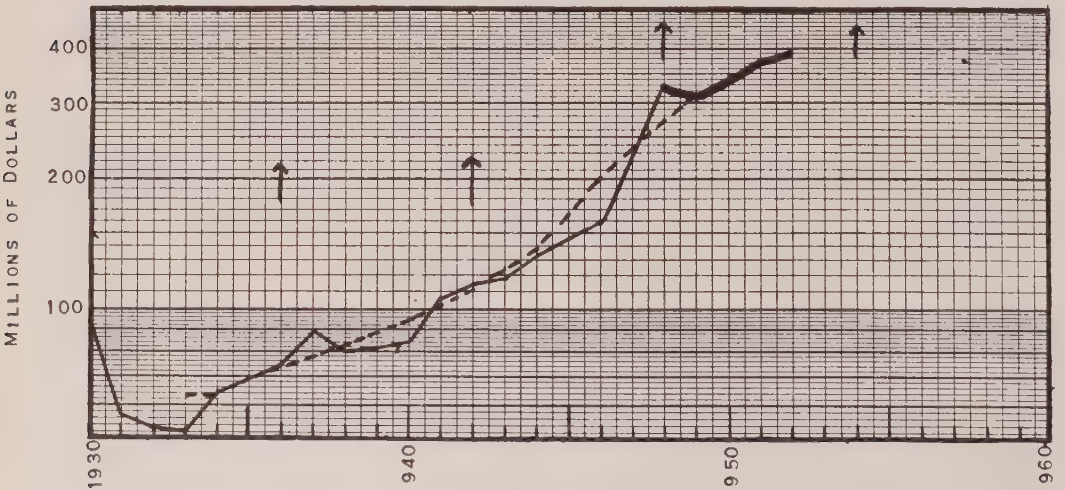


Fig. 1. Continental Oil Company Income, 1933-1952 together with trend. Arrows show ideal time for 6-year cycle crests. Heavy line shows income since 1948, when this 6-year cycle was discovered.

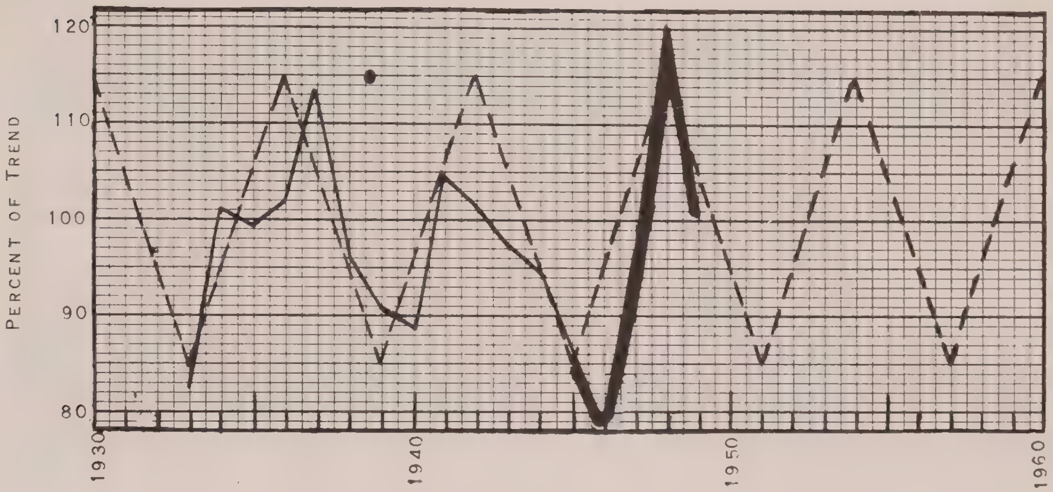


Fig. 2. Continental Oil Company Income. 6-Year cycle expressed as percent of trend, 1933-1949, and the ideal 6-year cycle. The heavy line shows how cycle has unfolded since discovery. Trend values for 1950-52 not yet available.

THE 6-YEAR CYCLE IN WILSON & COMPANY SALES

FIGURES for the sales of Wilson & Company, as furnished by the company, are available from 1927. They are charted in Fig. 1 on the next page.

In 1949, using figures through 1948, I observed a 6-year cycle in these figures. I showed lantern slides of this cycle to our members on my 1949 trip. I also printed a chart of this cycle in our report of December 1950.

Crests of the 6-year cycle in these figures come ideally in 1930, 1936, 1942, 1948, 1954, and so on. That is, these are the dates of the perfectly regular 6-year pattern which most nearly corresponds to observed behavior.

The 6-year pattern can be seen most clearly when the actual values are expressed as percentages of a 6-year moving average trend, as in Fig. 2. This procedure loses three values at each end of the series of figures, because a 6-year moving average trend cannot be computed beyond that point. Thus, in 1949, the last year for which we could know *for sure* how the 6-year cycle was coming out was 1945. In 1953 the last year for which we can know *for sure* is 1949.

The four additional values (1946, 1947, 1949, and 1949) are shown in Figure 2 by means of a heavy black line so that you can see how this cycle has been unfolding.

The low of the 6-year cycle came in 1946, one year late; the high of the next cycle came in 1947, one year early; but both peak and trough were of full average strength.

E.R.D.

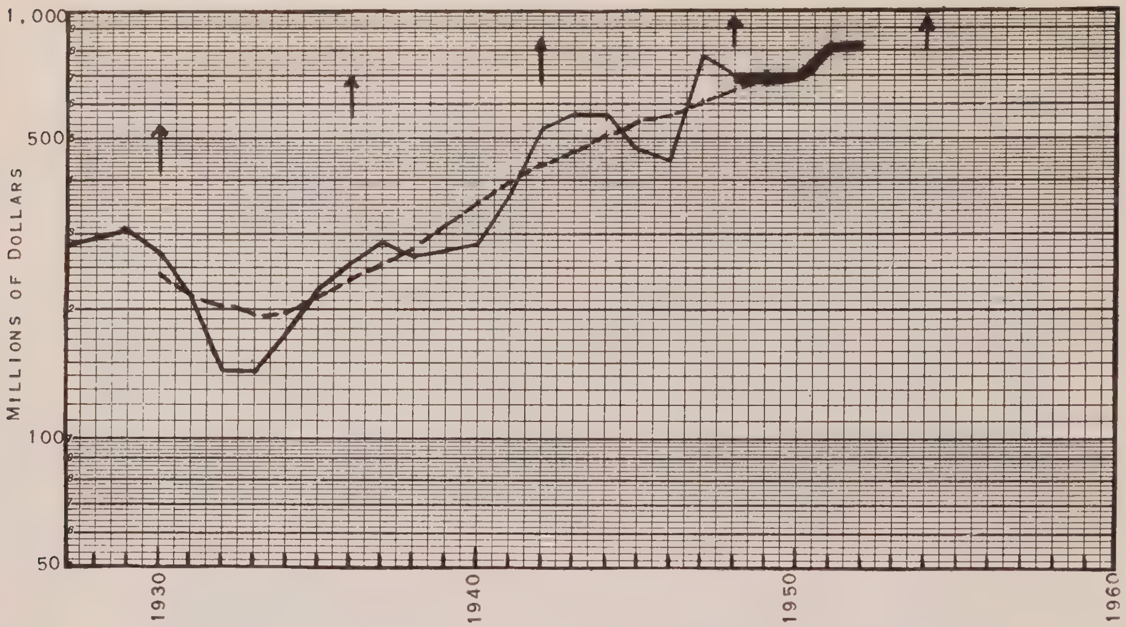


Fig. 1. Wilson and Company Sales, 1927-1952 together with trend. Arrows show ideal time for 6-year cycle crests. Heavy line shows sales since 1948 when this 6-year cycle was discovered.

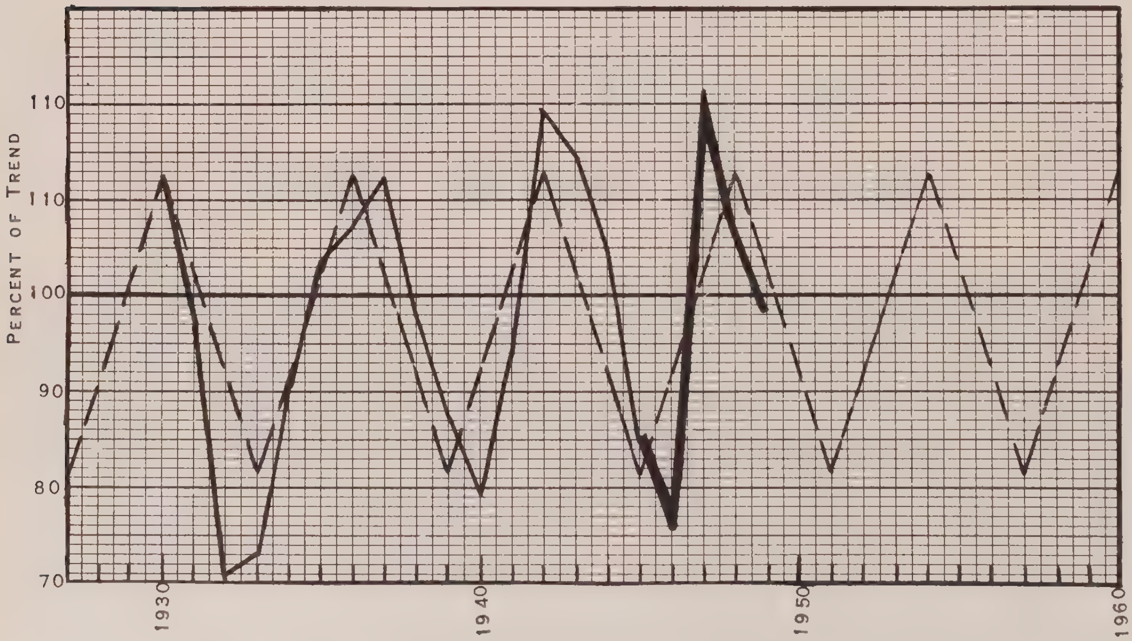


Fig. 2. Wilson and Company Sales. 6-Year cycle expressed as percent of trend 1930-1949, and the ideal 6-year cycle. The heavy line shows how cycle has unfolded since discovery. Trend values for 1950-1952 not yet available.

Letters

A Letter from Chicago, Illinois

Dear Mr. Dewey:

I have been studying the December 1952 issue.

With reference to Sears Roebuck I do not understand the charts as Sears sales have been rising over the last few years and your chart shows them declining.

Please advise how to read the chart correctly.

Thank you,
Edward I. Friedman

Chicago, Illinois

In reply I said:

Dear Mr. Friedman:

Your letter of January 9 has been forwarded to me from our publication office in New York. You are quite right that the sales of Sears, Roebuck have been rising over the last few years. Since 1943, every year except 1949, has shown a gain over the previous year. These facts are shown on Fig. 1, Page 347 of the December report; but Fig. 2, on the same page, shows that the rate of gain has slackened off. In other words, from 1945 to 1948, the over-all gain was unusually low.

If the 6-year cycle in these figures continues, the three years starting in 1951 should ideally show more than the usual rate of advance?

Does this answer clarify the charts for you. If not, please write me again.

Cordially yours,

A Letter from Georgia

Dear Mr. Dewey:

Several times you have invited questions concerning cycle studies. My questions may show I know little about the subject.

In some instances of supposedly pure chance cause, there are indications of cycles. These are noticeable in statistical quality control, where the cycles may indicate influencing conditions that are never located.

You probably are acquainted with Shewhart's bowl, such as was demonstrated by Eugene L. Grant on Page 85 of his Statistical Quality Control (1946), that includes 998 chips of a definite "universe." The 400 drawings on Page 89 were run in subgroups of four, that indicate a cycle.

As an experiment, we worked out the progressive average of four and it shows somewhat of a cycle movement. The periods are not equal, but the curve suggests that a progressive average of the proper number might result in a more definite cycle.

This is an example of purely chance cause operating at random in a known universe. Still it has a rhythm that follows a more or less definite cycle movement.

Are these cycles always to be expected in purely chance causes? If so, how are they to be eliminated from consideration in hunting for assignable, controllable cause? How eliminated in short term variation?

We thank you for your published studies, and wish you even more progress in the coming year.

Sincerely yours,
E. G. Field

E. G. Field and Associates
Atlanta, Georgia

In reply I said:

Dear Mr. Field:

You are absolutely right that there are cycles in random numbers. See an article on this subject in my report for January 1952.

I imagine that cycles are always to be expected in series of figures purely as a result of chance causes. I know of no way to distinguish (by internal evidence) between cycles present as a result of random causes and cycles present as a result of cyclic causes, except in terms of probability. That is to say, if in a series of figures, a rhythm has repeated itself a great many times with a great deal of regularity and dominance, we have behavior that could not easily have come about as a result of chance causes. Determining criteria are the degree of regularity of the cycle, the number of repetitions of the cycle, and the dominance of the cycle.

On the other hand you might have a very weak cycle with very few repetitions as a result of a perfectly real cyclic cause. The cycle present as the result of real cyclic causes might be weaker and have fewer repetitions than the cycle caused by random causes, but the "reality" of such a cycle could not be determined from internal evidence.

Cordially yours,

Foundation Affairs

OUR RESEARCH AND PUBLICATION OFFICES

YOU may wonder why we have our Publication Office in New York City; our Research Office in Western Pennsylvania. You might think it would be better for the two offices to be consolidated, and for both to be located on some university campus where we would have access to a good library and other acadamic facilities. It might, but it would cost more and we lack the funds. Also, there are personal reasons, as I shall explain.

Foundation Originally in Connecticut

The Foundation was originally located in Riverside, Connecticut. Riverside is part of Greenwich, a suburb of New York City. I lived in Riverside and turned over a wing of my home to the Foundation. When the membership plan started to grow, it was taken over by Mrs. Roessle, a family friend and neighbor. When Mrs. Roessle and her husband moved to New York City, the Publication Office naturally was moved to New York likewise. As her devotion to Foundation affairs, her zeal, and her ability, could not be replaced, the Publication Office has remained there ever since.

The Publication Office

The Publication Office, under Mrs. Roessle's direction, consists of herself and three part time workers, plus extra help as occasion demands.

When I decided to quit work and devote full time to Foundation affairs, the matter of finance had to be considered, as the Foundation was not able to pay me a salary. It so happened that I owned an estate in Western Pennsylvania on the Allegheny River about 60 miles north of Pittsburgh. On this estate was a comfortable 10 room house. My wife and I therefore sold our home in Riverside and moved to Pennsylvania. I have turned four rooms of the house over to the Foundation for Research Headquarters. We live in the remaining six.

Research Headquarters

At Research Headquarters we have a full time staff of seven people, including myself.

If you are ever in the neighborhood of either office, drop in. The New York office is at 9 East 77th Street, Telephone RHinelander 4-7482. The Research Office is at Bradys Bend (post office East Brady, Pennsylvania) on Route 68 about 20 miles east of Butler, Pennsylvania and 1.4 miles west of East Brady. Better phone before you come—East Brady 3715.

E.R.D.

MEMBERSHIP MEETINGS

THIS autumn I would like to take a trip around the country to meet our new members and to renew my acquaintance with our old members. To this end I plan a series of meetings in several of the large cities.

If you would like a meeting in your city, and will help with the necessary arrangements, please drop me a line. Address your letter to me at our Research Headquarters, East Brady, Pennsylvania.

E.R.D.

EXCERPTS FROM

CYCLES

THE SCIENCE OF PREDICTION

by EDWARD R. DEWEY
Director, Foundation for the Study of Cycles

and EDWIN F. DAKIN
Associate, Foundation for the Study of Cycles

TOGETHER WITH 1953 SUPLEMENT

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CYCLES

THE SCIENCE OF PREDICTION

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Concerning Economic Prediction

AN INTRODUCTION

It is the business of science to predict. An exact science like astronomy can usually make very accurate predictions indeed. A chemist makes a precise prediction every time he writes a formula. The nuclear physicist advertised to the world, in the atomic bomb, how man can deal with entities so small that they are completely beyond the realm of sense perception, yet make predictions astonishing in their accuracy and significance. Economics is now reaching a point where it can hope also to make rather accurate predictions, within limits which this study will explain.

In these pages we shall be primarily concerned with a new approach to economics and the problem of economic forecast, with the near-term future of the United States particularly in mind. This approach moves partly through some avenues that in the past have been the province of other sciences as various as biology, psychology, and mathematics.

The study here falls into two parts. First, it shows that rhythm and periodicity exist in the natural world, and that our economic world, analyzed with similar statistical tools, also displays curvilinear forms and distinct rhythms. Second, it deals with some of the ideas which underlie these facts, suggests implications which seem safely implicit in them, and indicates some meanings which such facts hold for all of us.

The debt of the authors to those whose names, equations and graphs line the pages of this book — and to many others unnamed — is without end. Theirs is the pioneering that is moving economics out of the blind alley where it stood for many years, so that it can take its rank as a true science.

There are those who, admitting that economics has not been an exact science, also insist that it cannot be, in the sense of predicting outcomes in human affairs. There are even some who consider prediction regarding human life as a kind of impiety — or fakery, at best.

That prediction regarding human affairs so often stands in ill repute with sober men (regardless of whether it " comes true " or not) often stems from techniques used in formulating it. It is less the forecast than the questionable methodology that often lacks scientific credibility.

The reader will be introduced to a method of thinking about the future which — new though it may be to him — seems definitely to have proved of value. It is this method which is of fundamental importance — an importance greater than any specific conclusions to which it may lead. For on its validity depends the whole value of the conclusions.

We shall find, as we go forward, that in this approach to economic phenomena we are abandoning the classical approach based on endless argument over cause and effect. It is hoped that the reader's reward will be the discovery that in economics, as in other sciences, we are apparently dealing with laws regarding rhythmic human response to certain stimuli that give a remarkable working tool to any man who is responsibly concerned with future outcomes — whether he be businessman, community leader, or statesman.

Law in nature, of course, is not the kind of law that is handed down by an authority. It is merely a summary of our observations concerning what has consistently happened, and what we may therefore expect to continue in a consistent universe. Such law permits us, in effect, to assay certain probabilities. The ability to calculate probabilities is a vital part of all our modern scientific progress. As Eddington has pointed out, in speaking of his own field of physics, "The quantum physicist does not fill the atom with gadgets for directing its future behavior, as the classical physicist would have done; he fills it with gadgets determining the odds on its future behavior. He studies the art of the bookmaker, not of the trainer." *

Probabilities have to do with *averages*. When the physicist predicts that a given group of atoms will act in a certain way, he is relying — as physicists now believe — on a knowledge only of what the *average* atom will do. Quite similarly, when an insurance company more or less accurately predicts the number of deaths for next year, it is relying on statistical averages of a like kind.

The discovery that the law of averages applies to humanity — that certain activities of people, viewed en masse, fall into definite patterns, some of which repeat themselves with periodic rhythm — promises to be of great aid in making economics function as a true science.

These patterns will not tell us what any given *individual* will do — any more than laws in physics will tell what a particular atom will do, or life insurance statistics will reveal whether a given individual will die. But the patterns do reveal how masses are likely to act at given times. And to that extent they are a formulation of law.

This discovery has had to wait upon the development of the science of statistics, the invention of index numbers, and the compilation of statistical series over long periods. Today the work is only beginning.

Adequate statistics have not been kept for more than a few generations. Thus we are like doctors following Pasteur, who had incontrovertible evidence that germs exist, but in only a few instances had isolated the germs involved in particular human states.

To assume that from our present limited store of knowledge we can henceforth predict the course of life for humanity would be childish. But we already have discoveries of importance. As the community becomes better informed of their value it will doubtless help us to extend them. Most important, to whatever extent the limited knowledge we do have can be put to practical use, it would seem that now is the time of times to bring it forth.

---

* A. S. Eddington, *The Nature of the Physical World* (p. 301), The Macmillan Company.

To be completely exposed to surprise by events — in the complex age we live in — is a fair route to the insane asylum. Experiments at Yale University, on a pig they called " The Broker," have demonstrated that a nervous breakdown can be instituted even in a porker, if he is given shocks of surprise repeated often enough.

A people must plan in order to live. Even an installment purchase assumes a plan for the future. Presidential predictions that " prosperity " was just around the corner in 1930 were well intended, but badly served an entire nation. And esteemed government economists, who predicted unemployment in this country of at least 8,000,000 for the spring of 1946, similarly performed a national disservice. A whole government program was laid out on the basis of a forecast which events proved erroneous.

When a people finds that predictions of many financial advisers, statesmen, historians, and other proclaimed experts are seldom better than the predictions of the astrologers, our social sciences have demonstrably not been earning their way. It is time for action.

This study is an attempt to show that something is indeed being done. The scientists who are busy at the problem seldom report their progress in the language of the average citizen. So their work often escapes his knowledge. The pioneering scientists will hardly be satisfied with this attempt to restate, in a simple way, the outcome of some of their researches. Some average readers, conversely, may feel equally dissatisfied, on the ground that the subject still seems abstruse and the language used is otherworldly, regardless of all efforts to avoid scientific jargon.

To both sources of justified criticism the authors apologize in advance. Every book, like every house plan, represents compromise; and a completely satisfactory compromise is a contradiction in words.

This book is an attempt to show, in an elementary way for the reader unfamiliar with this form of research, how some of the inept arguments over economic outlooks can be avoided by using a few facts that should now be familiar to all. This application of a new method to a study of economic activity, while relatively young, seems nevertheless more promising, in offering results, than traditional economic theories that fill textbooks with opinions and arguments over whether a given cause is really an effect, and vice versa.

Here are traced trends evidenced in various parts of the American economy — existing trends that can be calculated, measured, and demonstrated beyond reasonable doubt. The overwhelming evidence for distinct rhythm or periodicity in the cycles that accompany these trends is set forth. How such information may be used to assay future probabilities is then suggested.

Before reaching the end of the book, the reader will have attained, it is hoped, some new insight for gauging the probable future that faces America in the years following the most disrupting war in all world history.

The student of periodic rhythms in human affairs has a tool which the law of averages itself puts into his hands. If trends have continued for decades, or if the oscillations of cycles around the trend have repeated themselves so many times and so regularly that the rhythm cannot reasonably be the result of chance, it is unwise to ignore the probability that these behaviors will continue.

The result is not prediction, in the sense in which the word is ordinarily understood. If the reader nevertheless wishes to regard essential parts of this book as prediction, then it should be emphasized that the " forecasts " are written by the data themselves. They emerge as tendencies in the organisms being studied. They do not rest on the opinion of any man, or men. They are, in effect, the *probabilities* of tomorrow.

I

Why Trends Are Important

THE FACTS of growth are common knowledge to most mothers, who are encouraged by doctors to keep a weight chart around the nursery, for reference at weighing time. All healthy babies, like other healthy young organisms, show large initial rates of growth — over 100 per cent for babies the first year. As they get older, the rate of growth gradually falls off. At the approach of maturity, the rate of growth finally reaches zero.

Why it is that an organism stops growing we do not really know. We believe that biological organisms — whether dogs or babies or other animals — have their growth controlled by inhibiting secretions of glands. We are not so sure what it is that controls the size of different kinds of trees, or, say, of a Jimson weed.

But knowledge that such an inhibiting factor does exist is important to us, even when we cannot explain it. We find it reasonable that such a factor should be at work in organisms like a baby or a tree, just because we are used to observing it in action. But it also works in other kinds of organisms, such as human institutions and business organizations.

Few executives are used to thinking of a business enterprise as an " organism." But it does have a rate of growth that can be shown by a trend line. For the weight figures, which we might consult in establishing the trend for a baby, we can readily take the business output, as revealed in successive sales figures.

Suppose we draw such a trend for a hypothetical business organization which shows average annual sales of $20,000 during its first year of business, and proceeds as follows:

		Annual Sales	*Five-Year Growth*
1905	Company founded	$ 20,000	
1910	Five years after founding	38,000	$ 18,000
1915	Ten years after founding	68,000	30,000
1920	Fifteen years after founding	116,000	48,000
1925	Twenty years after founding	186,000	70,000
1930	Twenty-five years after founding	279,000	93,000
1935	Thirty years after founding	391,000	112,000
1940	Thirty-five years after founding	508,000	117,000
1945	Forty years after founding	609,000	101,000

Offhand this looks like a business that has been expanding rapidly, with a satisfactory forward thrust every five years. But if we analyze the figures, we find them showing signs of what, on the contrary, is a " dying " business. Years may pass before the business really goes under. But it has long been approaching maturity. What the figures show us is a steady decline in the *rate* of growth. The declining rate, by five-year periods, is as follows:

RATE OF GROWTH
1905–1910, 90% of actual sales in 1905
1910–1915, 80% " " " " 1910
1915–1920, 70% " " " " 1915
1920–1925, 60% " " " " 1920
1925–1930, 50% " " " " 1925
1930–1935, 40% " " " " 1930
1935–1940, 30% " " " " 1935
1940–1945, 20% " " " " 1940

It is obvious from the table that during each five-year period the rate of growth of this hypothetical business has decreased 10 per cent and that, if these tendencies continue, the rate of growth in the future will be:

1945–1950, 10% of actual sales in 1945
1950–1955, 0% " " " " 1950

In other words, we see that by 1955 the momentum will cease entirely. By then the organization will become another one of those many which follow a groove in a mature and conservative way — probably entering into a moderate decline until either aggressive competition shoves it aside entirely or " new blood " comes into the picture to give the aging institution a new start-off. A chart showing the sales for this hypothetical business would look like the solid line in Fig. 1.

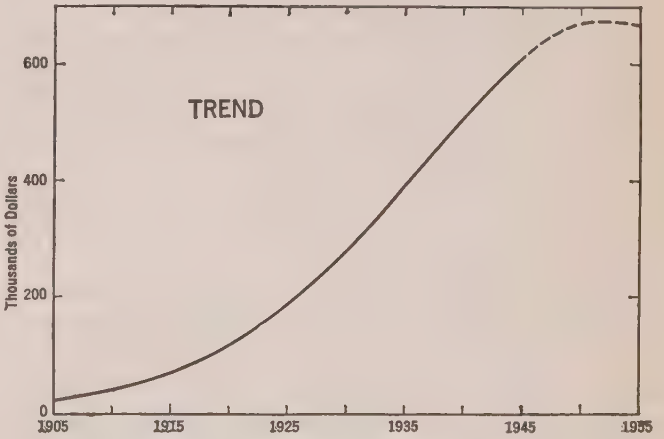

FIG. 1. TREND OF A HYPOTHETICAL BUSINESS ORGANIZATION

Data — 1905–1945, with a projection to 1955. The projection is based on the assumption of a continuation of the constant decline of the rate of growth, as discussed in the text. (For the same data plotted on ratio scale, see Appendix I, Fig. 5.)

This line can easily be projected. We have assumed that sales in 1950 will be 10 per cent greater than 1945. The table shows that sales in 1945 were $609,000. Adding 10 per cent gives $669,900, projected sales for 1950. Assuming that 1955 sales will show no growth over 1950 gives a sales total of $669,900 for this year also. The projected figures are shown by a broken line. Projections of this sort, based on rate of growth pattern and showing the approach to what we may call " maturity," are important tools for all students of practical economics.

In our hypothetical picture here, the design is that of a very regularly declining rate of growth — a regularity which is hardly typical of any of the institutions we shall study. But it is useful for illustrating a fact that both businessmen and investors usually overlook: The rate of growth in an organism is a sound index to its vitality.

It has become the custom in recent times, for instance, for investors to look well on organizations that have paid regular dividends over a long period of years without a gap. Such a record does bespeak sound, conservative management. But it does not suffice, taken alone, to show that an organization has in it the vitality to continue successfully if dynamic new competition rises to face it.

In an era when entirely new sources of energy are being discovered, and when our industrial chemists are creating commercially new materials that never even existed before; when we enslave new breeds of living organisms and put them to work for us in vats; when any country with raw materials can make machines and any nation with machines can make raw materials *— in such a day new forms of competition can arise rapidly. Therefore the trend line in established industries becomes a more important economic study than ever before. Just as the figures for any one business may be analyzed to reveal the trend, so may the figures for a group of businesses, such as those that comprise a manufacturing industry.

In the United States we have a number of great industries — often called " basic " industries — which are fundamental to the support of our established pattern of living. The trends in these industries are of significance to all of our people, and not merely to the executives and workers and stockholders in those particular fields. Such trends do not have isolated meanings. They indicate plainly the state of given organs in the economic body we call the nation. If a similar trend shows up simultaneously in a number of the vital organs, we have conclusions that are in many ways applicable to our nation as a whole.

As we shall see shortly, the trends existing in a number of our great industries show definitely that we have been reaching a period of basic " maturity " in our whole economic development. This is a fact of enormous implications that reach in many directions. The implications are so great, indeed, that many people (as usual with humanity) find it easier to deny the fact, in heated argument, than face it honestly and then proceed to deal with it. The argument has reached into the realm of politics — where the only justifiable debate should be concerned not with the reality of the fact, but with what to do about it. It has entered the life of the average man; it has entered the lives of business and social institutions; it is reflected alike in national defense problems and literary patterns.

Here the fact will concern us in just one fundamental way: its effect on business cycles. Business cycles — we shall later define the term more exactly — are not up and down departures from a horizontal line. It is more useful to think of cycles as waves moving around a curved axis, that axis being the trend. (If you like to think in terms of pictures, throw away the one of cycles seen as the jagged peaks of a level picket fence. Visualize instead the peaks of a fence going up and down hill, or a coil-spring which is stretched over a bent poker as the core.)

A more or less typical trend line, around which a simple cycle is moving, looks approximately like Fig. 2. If this trend line represented the growth of your own business, and the cycle represented ups and downs in sales, one thing would be clear: you would not feel dips in the cycle nearly so seriously when you were growing rapidly as you would when the trend had leveled out. For when the trend is shooting up rapidly, the bottom of one cycle is a " depression " only by comparison with its own peak. The bottom may be actually at a *higher* level than the peak of activity in the preceding cycle.

This fact applies to every single business, and it applies to a whole economy. In the years between the Civil War and World War I, when the American economy was expanding at a very rapid rate, the bottom of one depression often represented a level of economic activity not much lower than preceding peaks of prosperity. Hence many a businessman of that extraordinary era knew just two kinds of " times " — times when business was good, and other times when it was better. Business, even in depressions, was good; although it was under the level of recent peaks, it was still equal or possibly even superior in volume to levels established at other peaks in the fairly recent past.

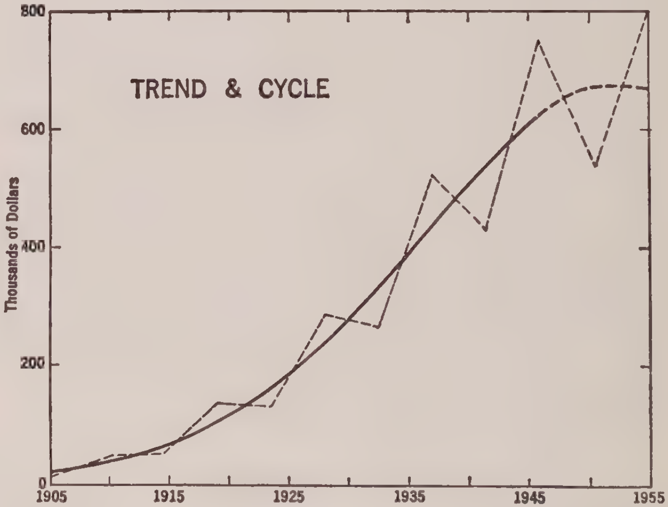

FIG. 2. THE TREND AND THE CYCLE

Trend of a hypothetical business organization as shown in Fig. 1 with a regular 9-Year Cycle of 20 per cent amplitude superimposed. (For the same data plotted on ratio scale, see Appendix I, Fig. 6.)

Figure 3, for instance, is a chart which shows roughly the ups and downs in our industrial production between 1884 and 1937, with a superimposed trend line. The chart has purposely been split into two parts. In the first part, up to about 1920, the trend was rising rapidly. In the second part, after 1920, the trend has pretty well leveled out. In the former, the eye can easily note that the depression lows *a*, *b*, and *c* were still practically as high as earlier peaks at *A*, *B*, and *C*. However bad business may have seemed at such lows, it was still at a level that had represented an all-time peak not too long before. Hence it still seemed pretty good.

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* See Virgil Jordan's *Manifesto for the Atomic Age* (Rutgers Press, 1946), p. 21 ff.

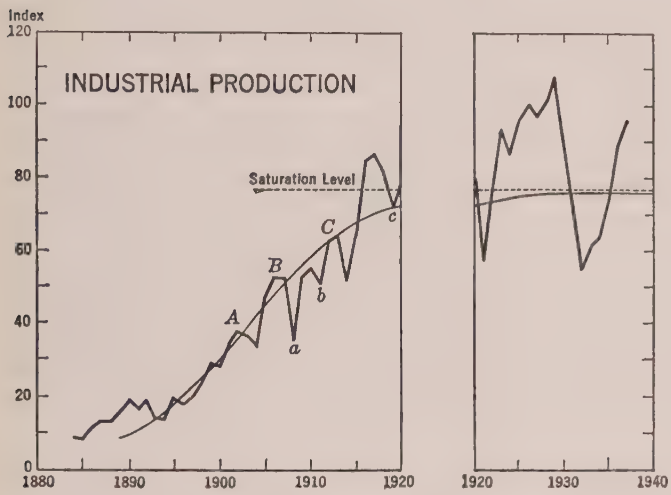

FIG. 3. GROWTH OF INDUSTRIAL PRODUCTION IN THE UNITED STATES
Data — 1854–1937, together with Trend (after Davis). The chart has been split into two parts to emphasize the changing character of the trend. (For the same data plotted on ratio scale, see Appendix I, Fig. 7.)

But now note what happens following 1920, when the growth trend begins to level out. From that point on, depression points really mean something for the economy to experience. They are depression points not merely by comparison with recently experienced peaks. They are depressions that become absolute in character. There is no lift in the trend line to alleviate them.

There are factors present in our economy to indicate that hereafter our major depressions will have this character. These factors suggest serious future problems for the nation and for the individual businessman. Without enjoying henceforth the advantages of a rapid rate of growth, we may find depression periods harder to bear. Also there is no ground for belief, as we shall note later, that a completely " managed " economy is more likely to avoid wide economic swings than is a free one, granting no difference in the rate of growth.

The businessman is going to have to anticipate depressions and plan for them wisely, or suffer unprecedented penalties. In the years when our economy was expanding rapidly, a businessman might make very faulty judgments and yet be saved from disaster, or even thrust into success, by the sheer momentum of the national growth. If he failed to sense the coming of a depression, or to time it accurately, why worry? Even the depression bottom was higher than the peak of a few years before. This situation is no longer true. It has not been true since 1918. A greater premium than ever before is imposed on the ability to time the turns in the business cycle correctly.

Many of our businessmen have looked on the depths that were reached in 1932–1933 as a development completely accidental, and one unlikely to recur. But one glance at the second part of Fig. 3 shows why the recurrence of a fall of magnitude seems probable if and when our economy slides into a depression again. This chart shows how the trend line in our economy has leveled out, so that no rising trend is present to compensate for a fall in the business cycle.

The phenomenon of increasing intensity of depression — as an economy approaches the upper level, or asymptote, of its trend — is shown suggestively in the history of the Spanish Empire, one of the earliest social organisms for which we have any useful statistical record. E. J. Hamilton, in his study *American Treasure and the Price Revolution in Spain,* has provided us with elaborately detailed estimates of Spain's total imports, valued in standard pesos, from 1503 to 1660. On the basis of this data, Harold T. Davis has constructed an index of Spanish trade for this period which is charted in Fig. 4, together with a trend line which has been added by the authors. The period includes most of the great growth and expansion of the Spanish Empire. Of particular interest is the series of deep depressions that begin to appear after the trend line begins to reach maturity.

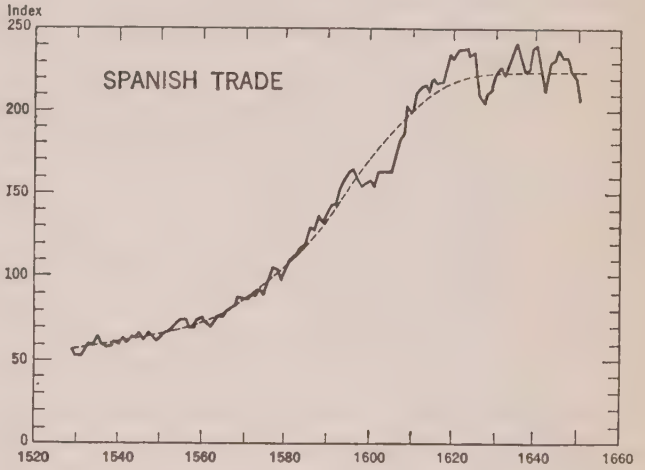

FIG. 4. INDEX OF SPANISH TRADE
Data — 1530–1650 (after Davis and Hamilton) together with Trend. (For the same data plotted on ratio scale, see Appendix I, Fig. 8.)

In very recent years we have discovered a great deal of new information on this subject, and a new application of scientific methods in its use. But before we reach the problem of the cycle we must know more about trends, and how they are determined and estimated.

II

Patterns in Growth of Organisms

A GROWTH TREND amounts to a pattern; and the pattern is similar for almost all organisms, whether a group of cells in a pumpkin or a group of human beings in a nation. The one has a range of life measured in months, the other in centuries. But the general pattern of growth is much the same. Even more surprising, a similar pattern may be discovered in the growth of human institutions like corporations and industries, as we shall see.

Much of our current knowledge of the laws of growth has developed from the pioneering work of Lowell J. Reed and Raymond Pearl, of Johns Hopkins University. Pearl has briefly described the outcome of their initial research, begun in 1920, as follows:

> As a result of applying certain biological reasoning to the problem, we hit upon an equation to describe the growth of populations, which subsequent work has clearly demonstrated to be a first approximation to the required law. As we were in process of publishing the first discussion of the matter, we found that a Belgian mathematician, P. F. Verhulst, had as early as 1838 used this same curve, which he called the "logistic curve," as the expression of the law of population growth.*

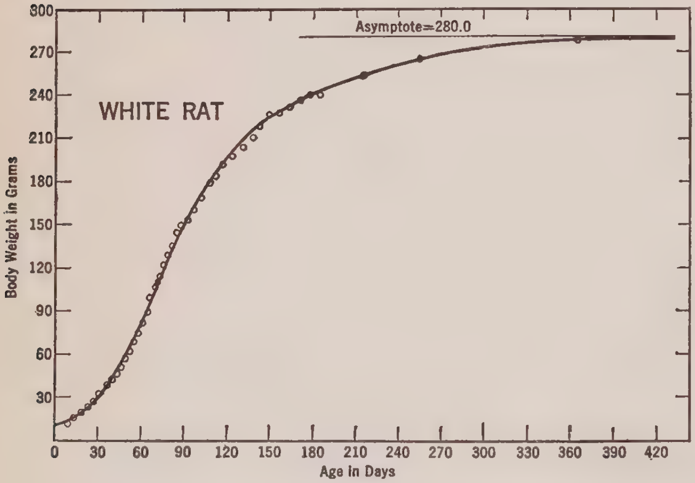

FIG. 1. GROWTH IN BODY WEIGHT OF A MALE WHITE RAT *(After Pearl)*

The study which Pearl published in 1925 under the title *The Biology of Population Growth* is still, some twenty years later, a readable, elegantly simple statement of a profound truth which has since been put to work in many fields. The curves Pearl and Reed explored permit city planners to forecast future city populations within a small margin of error; enable great utility companies to know with fair accuracy where facilities will be in greatest demand at a given future time. *The Biology of Population Growth* is still required reading for any executive concerned with a scientific approach to the future; a few of its many charts are reproduced here with the publisher's permission.

As Pearl points out, every living being starts as a single cell; the cell divides and is multiplied; the process goes on at different rates but without cessation until complete adult development is reached. Counting the cells is impossible after the very earliest growth stages; but periodically repeated weighings give a rough yet sufficiently accurate index of the increase in their number.

" The results of such periodic weighings give rise, when plotted upon co-ordinate paper, to a curve of peculiarly characteristic shape," Pearl showed. It is something like the shape of an elongated italic ʃ. The curve is similar, for instance, for the growth in body weight of a white rat (Fig. 1) ; for the growth in weight of a pumpkin (Fig. 2) ; and for the growth of a population of yeast cells in a test tube (Fig. 3) and of fruit flies, or *Drosophila,* living in a bottle (Fig. 4) .

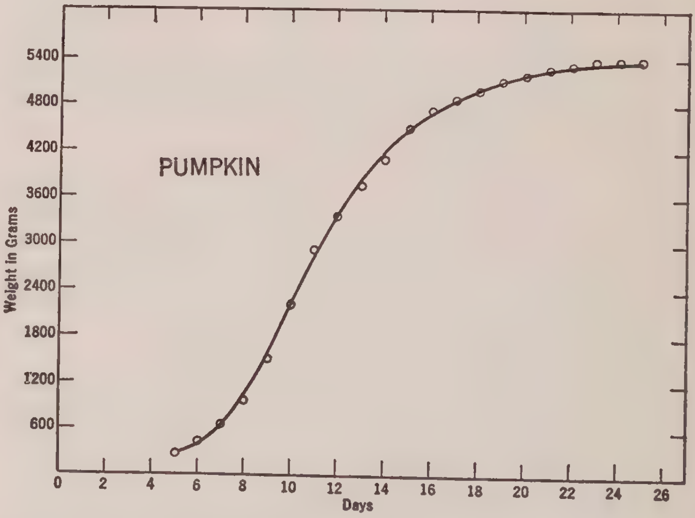

FIG. 2. GROWTH IN WEIGHT OF A PUMPKIN *(After Pearl)*

This much seems extremely logical. A population of yeast cells or fruit flies, living in a closed environment, could be expected to reach some upper limit of balance between the number of cells and the living space available. To find a consistent curve in approaching such a balance does not seem surprising. But when Pearl turned to

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* *The Biology of Population Growth* (p. 3–4), copyright, 1925, Alfred A. Knopf, Inc.

While there are scientists who have shown a disposition to question some of the Pearl methods — on the ground, for instance, that he did not determine the probable errors of constants — and while almost limitless work in this field is still to be done, it remains that Pearl's contribution is of extraordinary usefulness.

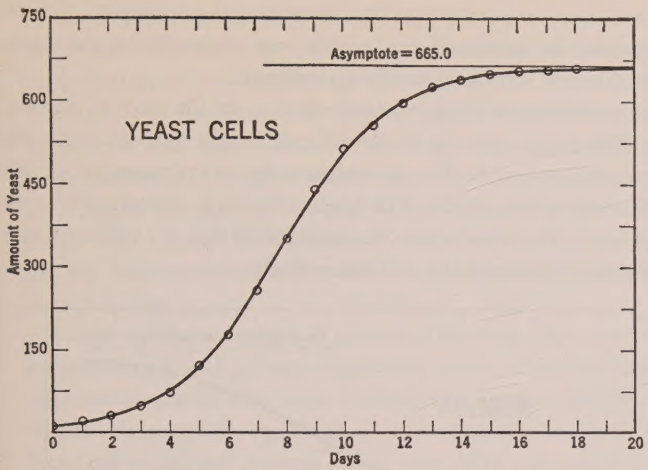

FIG. 3. GROWTH OF A POPULATION OF YEAST CELLS *(After Pearl)*

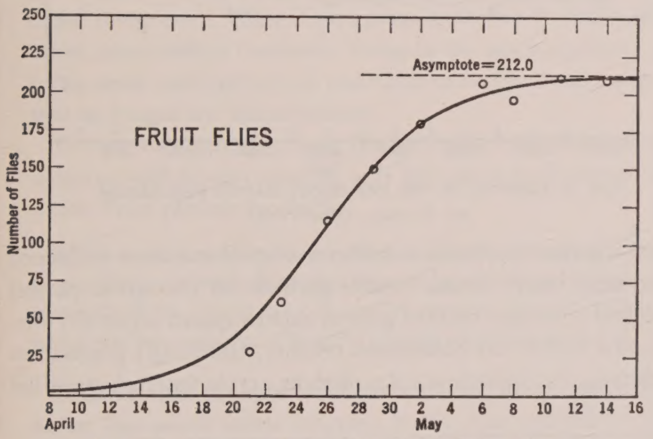

FIG. 4. GROWTH OF A POPULATION OF FRUIT FLIES IN A BOTTLE *(After Pearl)*

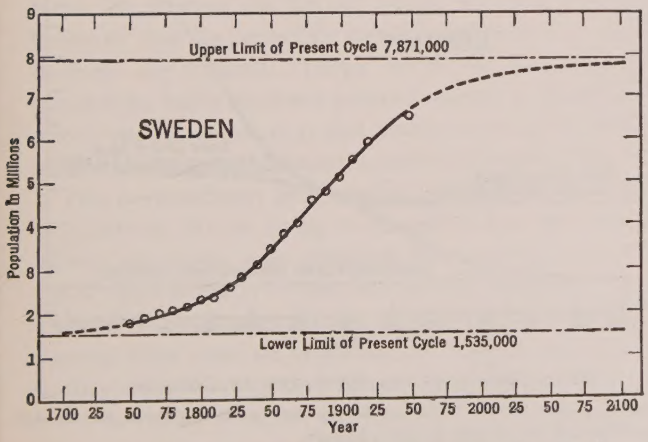

FIG. 5. GROWTH OF THE POPULATION OF SWEDEN *(After Pearl)*

he study of human populations, he found the same law of growth perating.

This demonstration does not conform so readily with the processes of our human logic. For human populations are subject to plagues and wars, to emigration and immigration, to birth-control movements and counter birth-control movements. They grow under conditions that seem far removed from the controlled environment of *Drosophila* in a test tube. And yet, as Pearl showed:

> Sweden has grown in a manner which, in its quantitative relations at least, is essentially like the manner in which a population of yeast cells grows. . . . Except for the amount of time covered by the observations, this curve for the United States is strikingly like that of Sweden. . . . For France . . . the growth has evidently followed, during the epoch or cycle in which it now is, the same basic law as that of Sweden and the United States. The same thing is true of the known population growth of Austria, Belgium, Denmark, England and Wales, Hungary, Italy, Scotland, Serbia, Japan, Java, Philippine Islands, the world as a whole, and Baltimore city.*

The similarities Pearl mentions show up graphically in his charts for Sweden, the United States, and France, reproduced in Figs. 5, 6, and 7.

Now comes a vital and significantly useful fact. *When a consistent pattern of growth exists, we have sound grounds for making predictions.* However qualified those predictions may be, they have the probabilities on their side. Thus, when we have enough census records — as for the United States — to establish a number of points on the chart of its population growth, we may observe the pattern of growth that exists; and knowing what the pattern is, we may project it into the future for purposes of prediction.

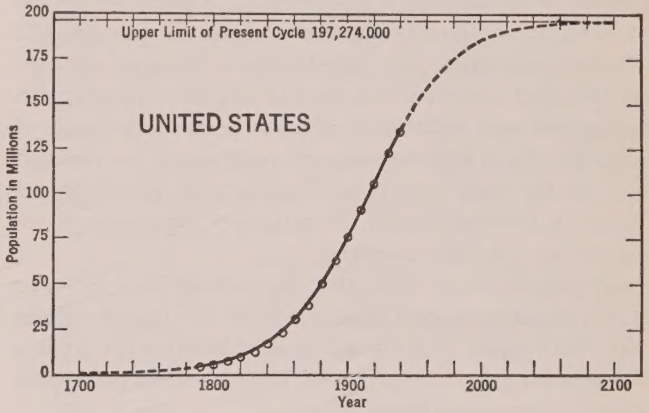

FIG. 6. GROWTH OF THE POPULATION OF THE UNITED STATES *(After Pearl)*

We may similarly project it into the past. France, for example, is an old nation; but we lack reliable census data for France before 1800. Data available since then, however, are sufficient to create the segment of a curve which may be projected backward as well as forward. The curve for France's present cycle of growth had practically reached its upper limit in prewar days, and suggested decline.

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* *Ibid.*, pp. 13–17.

The period of time required by a given nation to go through the familiar pattern of growth varies greatly. With France, the period seems to have been something over four centuries for its current cycle.* But records for Algeria convinced Pearl that this one small country had lived through almost a complete cycle of growth, from youth to maturity, in less than a hundred years — that cycle comprising the period of open French control following conquest, which seems to have been completed around 1850 (see Fig. 8).

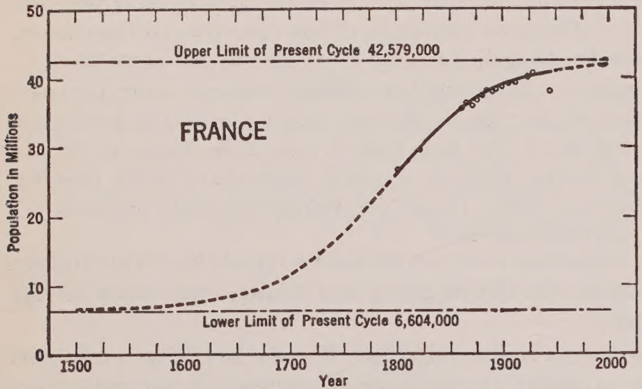

Fig. 7. Growth of the Population of France *(After Pearl)*

This leads to another striking observation. Algeria was an old country, with an indigenous population, before it was brought under French domination. The introduction of French control apparently launched a new cycle in the nation's life. Alterations in the environment were sufficiently radical to permit a new cycle of population growth to superimpose itself on whatever old one had existed — one for which we have no census records. When the new trend began, it followed exactly the pattern of expansion we are now familiar with in other countries.

We may thus reach an interesting observation. New cycles of growth may be superimposed upon old ones. We cannot predict when this will happen. Nor can we, as regards humanity, predict the conditions that permit it to happen. But a new cycle can appear when some fundamental change occurs.

If we put our colony of *Drosophila* into a larger bottle, with greater food supplies, a new cycle of growth would begin, but with a pattern quite similar in shape to the old. Similarly, a nation can apparently effect, through a reorganization of its resources, a change in environmental essentials which accomplishes much the same end. It seems to be established, for instance, that the introduction of an industrial economy permits a new rate of population growth substantially in excess of that which was sustained by the community when it was dominantly agricultural.

The world has striking evidence of this in the case of Russia, which following 1917–1918 entered into a new growth cycle. In terms of this new cycle, Russia stands today as the youngest of the great nations in the world. The United States is comparatively an old nation, in the sense of the dynamic forces that are reflected in a rate of growth, biologically and industrially.

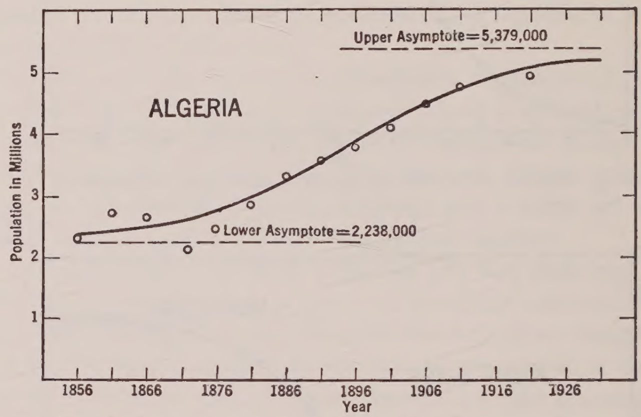

Fig. 8. Growth of the Indigenous Native Population of Algeria *(After Pearl)*

Pearl was convinced that a similar new cycle was once evidenced in Germany, where census records go back far enough to permit him to find a modern cycle of growth superimposed on an old one In the first half of the nineteenth century, Germany's population was reaching the upper level of growth in a cycle that had prevailed since the 1600's. For years the nation had been predominantly agricultural. The abortive democratic revolution of 1848 was coincident with the beginning of a new industrialization, conducted

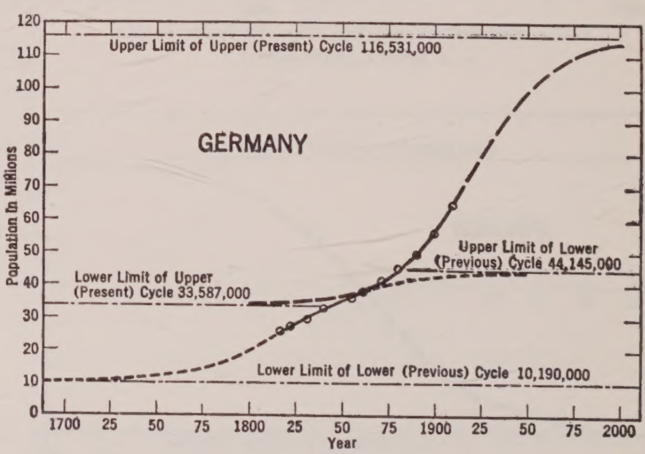

Fig. 9. Growth of the Population of Germany

This chart (after Pearl) makes apparent two cycles of growth which have overlapped during the period of census history.

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*On page 5 the word *cycle* was used to describe up and down departures or waves moving around a trend. Here the same word is used to describe a period of growth from youth to maturity. Both uses of the word are correct. *Cycle* comes from a Greek word meaning circle. It implies a coming around again to the place of beginning. Thus, the succession of events from the bottom of one business depression to the bottom of the next depression constitutes a cycle. The succession of events in a growth curve between stability at one level and stability at a higher level is also a cycle. Later we will use the word in still a third way to refer to *regularly recurring* ups and downs, as in the term *a 9-year cycle.*

under Prussian leadership, and new political forms. In the twenty years that followed 1850, this industrialization reached a development that permitted the swift defeat of France in 1870. The further unification of Germany that Bismarck then imposed seems merely to have added impetus to the new growth in strength already then established. These events were almost immediately reflected in a rapid increase in the population's rate of growth. The upsurge was clearly in evidence by 1870, and subsequent census figures demonstrated that a new cycle of growth had begun, as shown in Fig. 9.

Germany's new pattern of growth, following 1850, demonstrates an interesting and perhaps significant point, when her population chart is compared with those for England, France, and the United States: Germany in 1914 was in one sense the youngest of these four industrialized nations. This may help account for the extraordinary vitality evidenced by the German people in their rapid rise from their 1918 defeat — one which hardly disturbed their social integration. What it may mean hereafter is wholly problematical, since today's Germans, living in the world's greatest mass of ruins, seem only individual remnants or survivors of a population that no longer is a united nation.

For our own purposes here, the past pattern of Germany's population growth is worth noting only because it leads to a conclusion which Pearl phrases succinctly:

> When human social evolution does manage to put a kink in the curve of population growth, it has not done it by altering any biological law. It merely shifts, by a greater or smaller amount, the absolute base from which the law operates. Then the process goes on as before.*

It is possible to draw another conclusion from which Pearl abstains, but which seems inherent in the data available to us. The renaissance in the pattern of growth apparently does *not* occur, except concurrently with revolutionary changes in the environment. In viewing the United States, we have no grounds for believing that the prevailing trend in our population growth will undergo any material change, unless we simultaneously have grounds for believing that a great revolution in American affairs is due — and a revolution, at that, complete enough to permeate our political, economic, philosophic, and social institutions.

This is exceedingly important to understand, for it has further implications. We are going to discover that patterns of growth in human organisms — an organism like a group of workers associated in an industry — look and act very much like the patterns or trends in population growth. And, in further similarity — these patterns show what we might call an " urge to fulfillment." That is, they are consistent; they do not change capriciously; and *there seems no reason to expect any change unless we also imply a revolution in the constitution of the organism, or in the environment where the pattern is being worked out.*

It may well be that our discovery of a new source of energy, such as has been revealed to us by nuclear physics, or some of our revolutionary new advances in chemistry, which in effect give us new sources of raw material, do herald a fundamental revolution in our society. For instance, Dr. Hornell Hart, Professor of Sociology at Duke University, who believes many of the activities of the human race can be fitted to the Pearl logistic curves, suggests that harnessing of atomic energy may mean a steep upward swing in some of our familiar graphs.* Others may find themselves inclined to agree with him. Some hope, similarly, that the United Nations is a precursor of a new form of world government that could release wholly new energies in our nation. But it would be some time before we could be statistically sure of any such change. *When a new trend line is superimposed on an old one, the rise will seem to immediate observers like a mere rise in the cycle that rides on the trend.* Some years would have to pass before we could be certain that any such rise is not just cyclic in character, but amounts to a rise in the trend line itself — the imposing of a new, rapidly rising trend line on the old.

This much is worth noting: changes that accompany a new rate of growth in any given society are so profound, and so all-reaching, that old established institutions undergo a severe shake-up. This shake-up will be in evidence long before we get the statistical data to show what is really happening. It is not impossible that the economic and social upheavals being experienced by our own generation are the foreshadows, as it were, of revolutionary changes that ultimately will give us an entirely new curve in our population growth — to mention just one graph. Simultaneously, many new industries would be born; some older industries would take on a new lease of life; some would doubtless die.

For the present, we shall avoid speculation on matters of this kind, which are still far beyond the realm of statistical projection. Our concern here is not with guesses concerning possible new trends in our economy as they might appear in the future, but with study of the established trends as they can be statistically traced right now.

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1953 POSTSCRIPT TO CHAPTER II

The above words were written in 1944. Does the rapid growth of the United States in the last nine years suggest that a new trend line has been superimposed upon an old one? In such a matter the guess of one man is not much better than the guess of another. But for what it is worth, my guess is that the recent rise is merely a rise in the cycle that rides on the trend. I shall discuss this matter more fully later.

E. R. D.

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* *Ibid.* p 20

* *American Journal of Sociology,* June, 1946.

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